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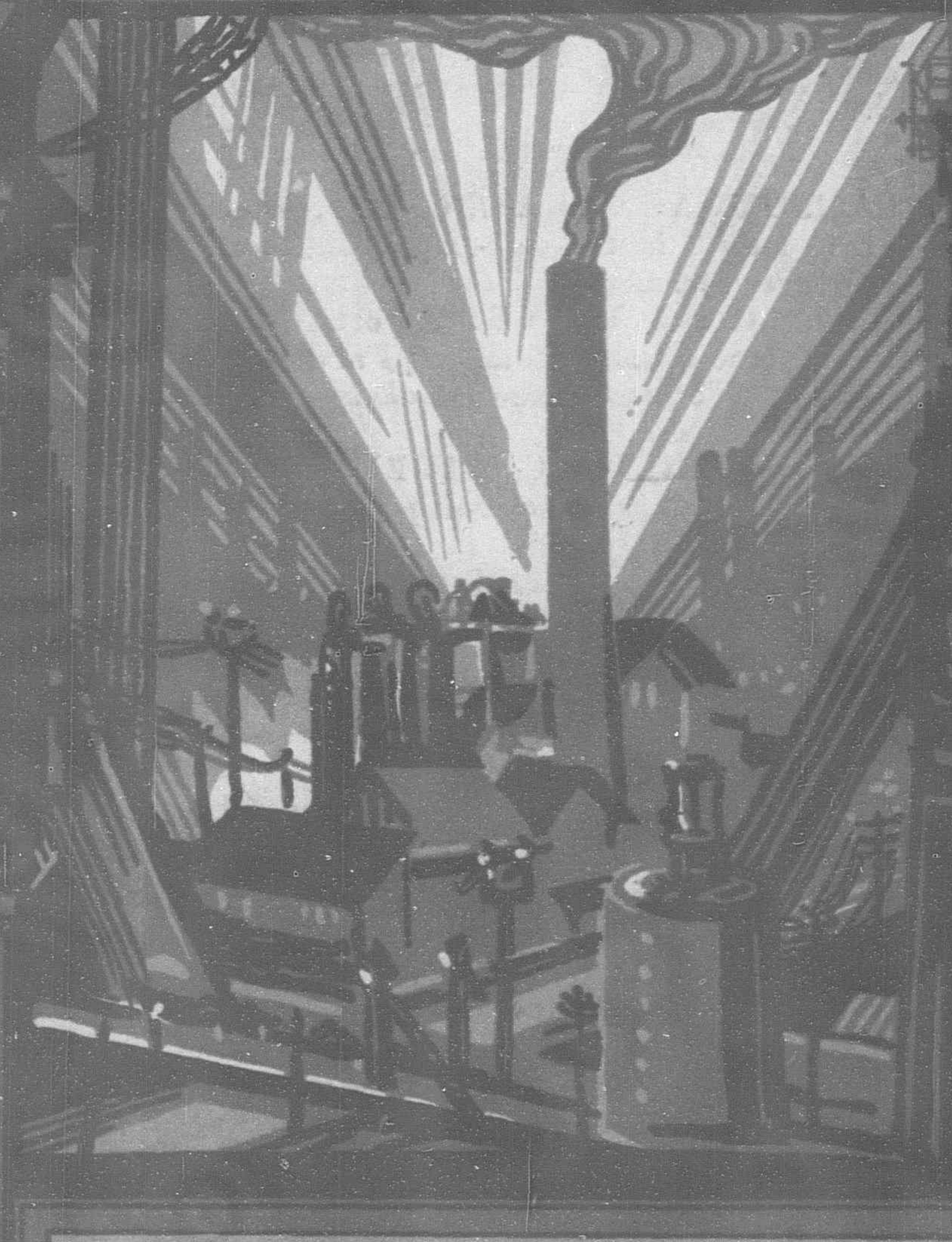

BEFORE IT IS TOO LATE!
THE HIGHWAY TO HOSTILITIES
JAPAN WALKS INTO A TRAP
THE PACIFIST ROAD TO WAR
AMERICA CANNOT FIGHT JAPAN

Vol. XXVIII MARCH, 1932 No. 3

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Before it is Too Late!

"The League expects that its members shall have peace in their hearts and not only in their mouths. It is not possible for any nation to cultivate hatred and hostility towards other countries and then expect the League to step in and save them from the consequences of that attitude."

THE above words of Lord Lytton are the most forceful, sane and statesmanlike utterance on the objects and purpose of the League that has appeared to date. Had they been broadcasted from Geneva before Dr. W. W. Yen sailed into action under his paraphrase of Nelson's battle-slogan, "*China expects the League to do its Duty*," the Shanghai incident might have been averted. For, in these few words conveyed to the Chinese university men in an after-tiffin speech on March 16, Lord Lytton dug down deep and exposed to view the roots of the present Sino-Japanese troubles.

China has been at war with Japan since 1895. The Treaty of Shimonoseki was merely a truce, under cover of which China prepared to exact her revenge, entering into a secret alliance which handed over her territory to Russia in order that the latter might do what China herself was too weak to do. That was the key of all China's subsequent troubles. Japan's victory in the war that followed and her succession to Russia's rights in South Manchuria embittered the Chinese and destroyed all hopes of permanent friendly relations between the two countries. Russia's defeat was China's second humiliation at the hands of Japan. She never forgot or forgave and neither can Japan forget or forgive China's secret diplomacy which forced this sacrifice upon her.

Unable to vanquish Japan by force of arms, the Chinese have resorted to pacific measures and propaganda. Since 1906, the United States as the champion of the Open Door, has taken over the rôle of Russia as the Ally of China, until by our notes, commitments and treaties, we stand to-day morally compromised to go to war in her behalf.

Unless we watch our step, quit writing notes and invoking treaties; unless we gag our pacifists, clamp down on anti-Japanese propaganda and stop interfering in matters which are none of our business, the United States will have to support its diplomacy by force. Unless we have this force and the will to use it, we are liable to be humiliated.

Lord Lytton speaks for the League of Nations. The League is interested solely in finding a peaceful solution to the Sino-Japanese problem. It is not concerned with causes or with consequences. Its mission is one of conciliation. The League cannot compel any of its members to use force against Japan. The British fleet will not leave its home waters to wage war in the Far East against an old ally. As Winston Churchill told us only recently; "Great Britain, at least, would not fight for Eugene Chen or any other war-lord who emerges from Chinese conditions." France, with her own difficult situation will laugh at any suggestion that she fight Japan, whose basic problem is the same as her own. The only nation that will be called upon to use force is the United States and if we permit ourselves to be manoeuvered into this position, we will fight alone. Make no mistake about that.

The League at this juncture cannot step in and save China from the consequences of her long drawn out campaign of hatred and war waged against Japan under cover of the Peace Pacts. The best the League can do is to find a temporary solution of the Manchurian problem that will preserve its own usefulness. It cannot constitute itself into a court and deliver judgment over the validity of treaties and other agreements which may set up a precedent that will be used for its own undoing. It cannot find a permanent solution of a problem which embraces a guarantee of Japan's treaty rights, strategic security and economic investments.

The League can do this only by inviting Russia to become a member and bind her to behave in Asia. If the League is unable or unwilling to press this, or if Moscow rejects its overtures and China remains incompetent to discharge faithfully her international obligations in these regions, then the League—and the United States—must make up their minds, and quickly, that they must guarantee Japan against aggression "from the direction of Urga," or get out of the way while Japan fights her own battle. The life of a great nation is at stake. It is no time for quibbling. The damage has been done.

Forces are at work in Europe to precipitate trouble between the Soviet and Japan in the hope that when Russia's attention is diverted to the Far East, Poland and the Little Entente can attack her from the other side. The situation is fraught with ominous possibilities. Japan is seething with reactionary discontent. The nation has been brought to the verge of disaster as a result of world business depression and the severance of economic relations by the Chinese. The future of Civilization in the Far East hinges on the outcome of the political crisis in Japan. Liberalism, conciliatory diplomacy and faithful observance of treaties on the part of Japan has brought her face to face with disaster. Unless some sympathy, support and consideration is extended to Japan in her present difficult position, the world may have to face the alternative, with a military government directing the affairs of a nation determined to fight for its right to exist.

On the findings of the League of Nations Commission now in China, hinges the future of Civilization in this part of the world. Unless something is done quickly to relieve the pressure of world opinion upon Japan as the result of Chinese and pacifist propaganda, Japan in sheer desperation may be driven to extremities to uphold her conception of the right to self-preservation.

For the past two years we have seen this issue coming and have endeavored in our own way to impress upon the world its significance. Chaos, anarchy and militarism in China, the non-existence of a government competent to discharge its international obligations and the waging of war against Japan under cover of the peace pacts, will make our prediction come true. China will go down to ruin and carry the rest of the world down with her. Snap out of it! Wake up and face the facts before it is too late! The shadow of this crisis is upon us.—G.B.R.

The Highway to Hostilities

Denial to Japan of the Right of Self-Preservation Will Lead to War

"Most modern wars may be ultimately traced to national antipathies which have been largely created by newspaper invectives and by the gross partiality of newspaper representations."

To this conclusion of the historian Lecky in his *England in the Eighteenth Century* must be added ; **and the marshalling of world opinion against a state by means of diplomatic notes and vicious official propaganda to blacken its character preparatory to applying economic sanctions or a declaration of open hostilities.**

By GEORGE BRONSON REA

AMERICAN opinion is beginning to express the thought that a grave mistake was made at the Washington Conference in giving Japan the dominating power in the whole of the Far East, but it is also realized that any attempt to disturb the existing naval balance would affect other delicate strategic problems equally vital to the objects of the Conference. On the other hand, serious minds in Japan are awakening to the fact that in order to preserve the peace of the Pacific, Japan surrendered her powers of defense on the mainland, exposing the nation to the certain comeback of Russia, the stark hostility of an implacable China and the inevitability of a showdown in which they will have to make a determined stand in defense of their national security.

Concerned solely with preserving the security of our insular possessions in the Pacific and the maintenance of the Open Door in China, Americans are indifferent to the menace to Japan's existence that looms in the other direction. The whole American peace program in the Pacific has been based on the theory that Japan was preparing for war over immigration and issues arising therefrom, ignoring that Japan's so-called militarism has been forced upon her by the open preparations of her former antagonist to resume the struggle of 1905 for the mastery of Eastern Asia.

Our Big Navy and Big Air Force enthusiasts insist upon transforming a good friend, whose welfare depends largely upon the maintenance of close economic relations with us, into the hypothetical enemy against which the nation must prepare. Never did a nation pursue a more unwise policy. Our insensibility to Japan's fundamental problems which from time to time find expression in diplomatic moves which impair her security, have engendered suspicions that unless clarified and rectified in time, must, in the interests of peace and good understanding, lead to another Conference in which Japan will demand recognition of the right to apply the same basic laws of self-preservation in Asia that underlie the American Monroe Doctrine or the similar principles which govern the unchangeable British and French conception of national security.

Principles which apply in Europe and America must apply in Asia. If they do not ; if the other Great Powers decline to arrive at some reasonable adjustment of these Asiatic problems that will permit Japan a free hand to defend herself, without impugning her motives and hampering her actions by reminding her at every step of her obligations to them, they may as well scrap the League Covenant, the Nine Power Treaty, the Naval Treaty and the Kellogg Pact and prepare for the inevitable.

The Causes that Make for War

The Japanese believe, and the evidence supports their belief, that their very existence is menaced by the operation of treaties they are expected religiously to observe while forces over which the other Signatories have no control have grown to such ominous proportions that the Powers must either guarantee Japan's security against this menace, or, stand aside while the Japanese fight their own battle.

If the Powers decline to guarantee Japan against aggression **from the direction of Urga** and still insist that she faithfully adheres to the letter and spirit of her commitments, **as defined by them,** there can be only one ending to the dispute. The War of the Races, of the White Man against the Yellow, the war that will make Communism supreme in Asia and hand its vacant spaces over to the prolific Chinese, will have to be fought.

There is absolutely no difference between the basic defense problem of Japan and that of France. Notwithstanding that Germany has been disarmed, France knows that the day will arrive when the pressure of American and British opinion will compel a revision of the Pact of Versailles and Europe will again resound to the tramp of marching armies. France is willing to disarm on condition that the United States and Great Britain guarantee her security and although Britain has agreed to this in part, the United States refuses to enter into any agreement that commits her to further military adventures in Europe. France has no illusions about the ability of the League of Nations or the Pact of Paris to preserve the peace of Europe, so she has carefully and at great cost created her own system of alliances, constructed a new wall of defense along her frontiers from the Channel to the Mediterranean, increased her land and sea forces, mobilized her financial resources, and in the most correct diplomatic language has told the United States and Britain that she will brook no interference in her affairs. France will fight.

Delicate International Balances

Japan knows that some day she must fight. For the present, her one security is the French system of alliances that operate as a check on Russia from the West. Should the Polish alliance and the Little Entente collapse and release Russia from attack in that direction, her hands would be free to carry out her cherished program in Asia. Any disturbance of the delicate balance of power in Europe that would diminish the pressure on Russia's western frontiers would be the signal for immediate war in the Far East, a war which would have to be fought by Japan alone. France therefore stands as the sole guarantor of the peace of Asia and the Far East, the only friend Japan can rely upon in her desperate struggle to preserve her security and right of self-defense against a combination of other Powers so intent upon enforcing their own policies that they give no heed to her danger.

The political line-up in Europe reveals Great Britain and the United States for purely economic reasons favoring Germany's demand for revision of the Versailles Treaty and supporting a chaotic China in her fight to escape recognition of a treaty extracted under duress, while holding Japan to a strict adherence to the terms of the League Covenant, the Nine Power Treaty and the Kellogg Pact, which deprives her of the right to make a move to defend herself without the consent of other interested Powers, a consent that the events of the past twelve years clearly imply will never be conceded.

Logical Possibilities

France and Japan are in the same boat, their very existence jeopardized by the refusal of other Powers to understand or sympathize with their problems. The French have officially denied the existence of any secret treaty with Japan but it goes without saying that there has been an interchange of views and an understanding that under given conditions will bring these two great powers together in defense of the same principles that America and Britain hold as indispensable to their own security.

If such a community of interests should find expression in any definite agreement, in the event of war in the Far East, the French and Japanese fleets would command the China seas from Singapore north and present a problem in naval strategy that would tax the combined American and British navies to overcome. Both Japan and France would be fighting for their right to exist. Keeping this in mind, there is always the possibility that if pressed to the wall, these two nations will come together in defense of principles now held as a quasi-monopoly by Britain and the United States. The world cannot expect Japan to conform to ideas, policies and treaties formulated for the maintenance of the **status quo** in Europe and the preservation of China's territorial and administrative integrity and independence, under cover of which Soviet Russia is conceded full freedom to extend her influence throughout Asia, carry forward the traditional Muscovite program of territorial expansion at the expense of China and use this country as the Far Eastern spring-board for world revolution, without making a determined effort to protect herself.

The Washington Conference, assured China's territorial and administrative integrity and independence, but subsequent events clearly indicate that this pledge was intended to operate solely against Japan. It did not prevent Russia's absorption of Mongolia into her system of Soviet Republics ; it interposed no objection to a secret understanding between Canton and Moscow ; it did not result in co-operative action or intervention on the part of the interested Powers when a Sovietized Cantonese army ran amok in Nanking and threatened Shanghai with the same fate ; it did not hinder the dispatch of a British army to defend the International Settlement, it did not stop the communization of the Yangtze Valley, but it did stop the application of sanctions in 1927 that would have saved the situation and avoided the aftermath. The Nine Power Treaty conferred upon China the right to do as she pleased in developing and maintaining for herself an effective and stable government, a charter of license and freedom from outside interference in her affairs, while she embarked upon a program of treaty abrogation, warfare against the "capitalist and imperialist Powers" and a set policy aimed at undermining the security of Japan and hastening her economic and financial ruin. If the Nine Power Treaty sets anarchy above the law ; if the military oligarchy that is China can abrogate treaties at will and refuse to recognize agreements upon which Japan's rights are based, resort to war within the Peace Pacts without fear of punishment or retaliation ; if through her weakness and instability China cannot discharge her fundamental duties as a sovereign state and defend her neutrality and territorial integrity in regions which vitally affect the security of a neighboring state ; if, after ten years there is no sign that China can fulfil her share of the 1922 bargain, then preservation of the Peace of the Pacific demands that this treaty be reconsidered and revised.

The Record of a Decade

Ten years have been frittered away while the outside world has waited patiently for the war-lords of China to make good on their promises. In these ten years, billions of dollars extracted from the people by every form of legal and illegal taxation, and that might have transformed China into a first class power and made for world prosperity, have disappeared into the maw of an insatiable military Moloch that holds the country in subjection. In these twelve years of immunity under the League Covenant and license under Nine Power Treaty, China has ruined herself, brought Japan to the brink of disaster and the world face to face with another catastrophic war. With three million men under arms and another two million bandits, communists and pirates all preying upon the country, China has sunk to a level where she has lost even the semblance of a medieval state.

The qualifications that entitle her to membership in a League of self-governing sovereign states have disappeared. China is now on a level with territories that come under Article 22 of the League Covenant, unable to stand by herself under the strenuous conditions of the modern world and discharge her duties as a state. Her sole support and guarantee of existence are a series of treaties based on a hope, and which entitle her to invoke their provisions to perpetuate a farce that has long since turned into a tragedy.

The well-being and development of five hundred million peaceful people enslaved and harried by an oligarchy of rapacious bandit overlords, must become a sacred trust of civilization, or civilization will pay the price for its indifference. Securities for the performance of this trust must be shouldered by the League of Nations if it is to survive as an instrument of world peace. If the League Covenant is interpreted as conceding to this group of irreconcilable, warring factions the dignity of a self-governing state with the right to a seat on the Council and a voice in its deliberations ; if the Nine Power Treaty is to continue to recognize this saturnalia of lawlessness and ineptitude as something sacred that must not be interfered with ; if, in other words, the war-lords of China are to be permitted all the time necessary to fight out their differences and unify their rule by the sword (a policy which the American Government declares it is prepared to uphold) while Japan is dragged down to economic ruin and exposed to certain attack through the inability of China to discharge her rudimentary obligations as a sovereign state, then the issue cannot be side-stepped. Treaties or no treaties, Japan will have to fight for her right to exist.

Japan Walks Into a Trap

SECRETARY Stimson's open letter to Senator Borah upholding the Open Door policy in China in which he stresses that the Nine Power Treaty was only one of several interrelated and inter-dependent instruments, raises the question as to just what was the real object of the Washington Conference. So many things were accomplished at that Conference that it is somewhat confusing at this date to understand what it was all about. If we go behind the official record and accept as truth the indiscreet revelations in Captain Yardley's book, *(The American Black Chamber)* the real objective was the British Government's desire to abolish the Anglo-Japanese Alliance while Washington was induced to sponsor the conference under an invitation to reduce armaments in connection with Pacific and Far Eastern questions. The decoding of the secret dispatches passing between the Japanese Government, its ambassadors at Washington and London and its Delegation to the Conference, was bad enough but their publication was unpardonable.

For the American Government to enforce the law against an employee for retaining and publishing the official documents he decoded would have been tantamount to a confession that the Government had been guilty of the discreditable act of obtaining and decoding messages passing between its guests and their government at home. The American Government could not even deny Captain Yardley's story as Tokyo would know only too well whether or not his decoding of its secret telegrams were true versions. The tremendous sensation occasioned in Japan by the appearance of the book would indicate that they were true decipherments, but whether true or not, the fact remains that the Japanese were humiliated and made to appear ridiculous. They felt that they had been tricked and the incident played into the hands of the military party relegated to the background as the result of a conference conceived as they believe for the deliberate purpose of circumscribing their activities and powers of defense.

Sponsored by the United States

Viewed in relation to the Consortium program sponsored by the United States and the objects of the Allied Intervention in Siberia, also sponsored by the United States, the Japanese, after reading Captain Yardley's book, are justified in believing that the Washington Conference was part of a fixed program to deprive them of their right of self-defense in regions where their national existence was at stake, a conviction that has since been strengthened by the admissions of Major-General Graves in his book, *America's Siberian Adventure*. Viewed in connection with the Kellogg Pact, also sponsored by the United States, which recognized the right of America and Great Britain to defend their vital interests in territories deemed essential to their national security, but denying this right to other nations menaced by forces operating in regions outside their jurisdiction, the Japanese feel that they have seriously impaired their right to defend themselves, a conviction that is being driven home by the trend of American and League diplomacy since the Manchurian issue was planted in September last.

It is for these reasons that Secretary Stimson's open letter to Senator Borah has provoked such deplorable reactions in Japan. Revealing as it does a determination on the part of the United States to adhere tenaciously to a policy that is seemingly indifferent to the rights of Japan to defend herself against a menace to her existence, the Japanese have the uncomfortable feeling that they have walked into a treaty trap that holds them fast while China, which dared not face them alone, is emboldened to finish the job through the torture of the thousand cuts.

The Open Door and Japan

The Japanese entertain no illusions about the future. They know that some day they will once more have to stake their national existence on the plains of Manchuria. They do not intend to remain passive in the trap, while their enemy is permitted full freedom to prepare for their undoing. Thirty years ago, the Japanese walked into the same kind of a trap when **without reservations** they subscribed to John Hay's Open Door principles guaranteeing the territorial and administrative independence of the Chinese Empire at the precise moment when the Empress Dowager had surrendered to Russia her sovereignty over Manchuria under the terms of a secret treaty of alliance aimed at Japan. At that time, Japan could make no move to defend herself. Her hands were tied through her commitments to the United States, while through the Open Door she watched her enemies furiously preparing to crush out her existence. America refused to uphold by force of arms the principle she had laid down as the law of the Far East, so in self-defense, Japan had to take upon her own shoulders the fight to preserve a doctrine the United States had sponsored. Japan fought that war blindfolded and signed a peace without the slightest inkling of the existence of the secret treaty of alliance between China and Russia which provoked and made the war possible.

China Escapes Responsibility

China emerged from the war as the innocent and injured victim whose neutrality had been violated and whose territory had been invaded by contending armies taking advantage of her military weakness. China appealed to the world for sympathy, declaring that the victorious Japanese had deliberately provoked a war for the purpose of despoiling them of territory. They got away with it. Even to this day with the full text of the secret treaty of alliance officially filed with the American State Department, the Chinese refuse to accept any responsibility for the Russo-Japanese war. Such is the universal prejudice against Japan and sympathy for China that the world rejects the evidence that would have justified Japan at Portsmouth in demanding as an indemnity from China the cession in perpetuity of the whole of South Manchuria. Had Japan known at Portsmouth of the existence of this secret treaty, the Manchurian question would have been settled then and there for all time. We have only to read the following extract from the statement issued by the National Government of China on February 14, to realize that China refuses to admit any responsibility for the events that led up to the war of 1904 between Japan and Russia:

> "At no time since the Russo-Japanese war has the Chinese Government doubted the purpose of Japan to seize Manchuria whenever an opportune occasion arose. At the conclusion of the Russo-Japanese war, which was fought chiefly on Chinese soil against China's protests, Japan put strong pressure on China to implement Japan's gains from Russia, and to grant Japan additional special privileges impairing China's sovereignty and contravening the 'open door' policy in Manchuria. China resisted these demands to the utmost of her ability."

Yet the full text of the secret treaty of alliance between China and Russia signed in May 1896, now reposes in the archives of the American State Department, together with the other official diplomatic documents of these days that prove conclusively Manchuria had been converted into an exclusive Russian preserve with its doors closed to foreign trade, residence and travel, and ruled over by a viceroy directly responsible to his Sovereign at St. Petersburg. China made no protests to the other Powers about this alienation of her territory. Japan was the enemy and she gladly handed over Manchuria to her secret ally in order that the armies of Russia could perform a task that she herself was too weak to tackle. China has never admitted these facts of history. Even after Japan restored her lost sovereignty over a territory that by all laws of warfare she had forfeited, China has never recognized the debt. She never will. Until she openly and frankly acknowledges the sacrifices her secret diplomacy forced upon Japan, there is little hope that the Japanese will ever forget or forgive.

History Repeating Itself

After a lapse of twenty-five years, Japan once more watches the careful preparations of Russia to regain her dominance in the Far East and again finds herself caught in a treaty trap set to preserve the peace of the Pacific and the territorial and administrative integrity of China. Again she sees China's territory handed over to a Russia pursuing the same identical program in Mongolia as she did in Manchuria.

Again she sees China in the rôle of a secret ally of Russia, making no protest to the other Powers against the incorporation of Mongolia into the Soviet system or exerting herself to regain her sovereignty and discharge her obligations to Japan. Instead, she sees Chinese border troops standing guard over Mongolia, preventing Japanese or other observers from investigating what is transpiring beyond the screen. She sees Communism firmly entrenched in the Yangtze Valley, defying the military power of the recognized government, and menacing the very existence of the state.

A sudden turn in the Chinese political wheel may align this communist element with the left wing of the Kuomintang Party in its fight for control of the Government and hand the country over to Moscow. Before admitting the realities of the situation, the Chinese would welcome a new alliance with Russia rather than comply with their treaty commitments with Japan.

Russia Wholly Untrammelled

Russia is not a Member of the League of Nations nor was she invited to sign the Nine Power Treaty. She stands firmly on her own bottom and defies the world. The League dares not dictate to Moscow. Any meddling with the balance of power in Europe would precipitate the catastrophe that all nations are striving to stave off. The Signatories to the Nine Power Treaty, with the sole exception of the United States, have broken the pact by entering into treaty relations with a nation that has violated the territorial and administrative independence of China.

The only check on Russia is the Kellogg Pact and Secretary Stimson's experience in reminding Moscow of her obligations under this instrument is not calculated to inspire confidence in her intentions when she is again ready to take positive action. Yet with these facts staring the world in the face, the League and the United States expect Japan to lay her case before them and receive their permission to defend herself against a menace their own short-sighted diplomacy has permitted to gather strength. To Japan, the menace is real and imminent. Unless she acts to defend herself, while there is yet time, she will face disaster. In another year, it will be too late. To bring her case before the League or discuss it fully and frankly with the Signatories to the Nine Power Treaty, would simply invite long drawn out public discussions and oratorical contests in which Japan would have to expose her

hand to an enemy not even represented at the meetings and over which the other nations have no control, while China would move heaven and earth to break down her arguments and defeat her purpose.

The Nine Power Treaty was conceived solely to protect China, and in any discussion to revise the treaty or recognize Japan's right to defend herself on Chinese territory, Japan would stand little chance of support from a group of Powers which meekly acquiesced in Russia's rape of Mongolia while holding Japan to her commitments. Japan is held fast in the trap and can escape certain destruction only by a strong, friendly China, discharging her obligations as a state, failing which, by freeing herself in time to fight for her life. There is no indication that the other interested Powers will exert pressure upon China to compel her to perform her part of the 1922 contract. On the contrary, there is every proof that China is to have all the time she wants in which to fight out her interminable civil wars and establish by the sword a stable and unified government, even if during that time, Japan is ruined economically and held firmly in the trap so the Bear can hug her to death at its pleasure.

The Powers will do nothing to avert the calamity that to Japan seems inevitable. Unless Japan acts to defend herself while there is yet time, the end is certain. Japan is facing the realities in Asia in the same way that France faces the realities in Europe, while the League and the United States are playing the game of make believe.

The Pacifist Road to War

Estimating the Costs

If the open letter of Secretary Stimson to Senator Borah represents the true sentiment of the American people, the warning conveyed therein will sooner or later compel the nation to enforce its policies by other than diplomatic or moral suasion.

If the Nine Power Treaty is to be construed as a charter entitling China to all the time necessary to create and develop a stable government with no regard for the effect that an indefinite prolongation of the present chaos and anarchy may have on the welfare and security of her next door neighbor, then the other seven Signatories may as well mobilize their fleets, gather together their transports and get ready to enforce their peculiar conception of international justice. Or, if they prefer the more deadly and inhuman way, they can apply a boycott against Japan, starve her babies, her women folk, the aged and the feeble by depriving their wage earners of markets for the product of their toil and salve their conscience by deluding themselves that they have not resorted to war. We can hide benind the Chinese conception of warfare and slaughter the Japanese by the hundreds of thousands and fool ourselves that we are being just and merciful, but, it will be war just the same, a massacre of the innocents as cold-blooded as bombing or gassing an unfortified city.

Faced with the horrors and miseries that the application of economic sanctions would entail, the grim necessity of survival would bring the Japanese nation together as one man to make a last desperate struggle for their right to exist, a war to the death with no quarter given or asked. And at the very outset of the application of economic pressure against Japan, American commerce with China would come to a sudden stop. Debarred from passing through the ports of Japan, American vessels trading with China would be compelled to pass through the Loochoo barrier or the Formosan Channel and the increased war-risk insurance on vessels and cargoes would make trade prohibitive. Either the American battle fleet would have to immediately engage and destroy Japan's sea power or the boycott against Japan would automatically be extended to China. Faced with force, Japan would also resort to force and China who had brought this calamity upon Japan would be shut off from the rest of the world and plunged into a worse condition than she is to-day, China could expect little mercy from a nation facing extinction as the result of her refusal to set her house in order and comply with her obligations. When our ferocious pacifists at home and misguided enthusiasts in China loudly applaud the boycott weapon as a means of coercing Japan to accept their viewpoint, they fail to realize that the severance of American economic relations with Japan would be followed immediately by the cessation of American trade with China. It might be all right for the home pacifists who have nothing to lose, but it would carry disaster to American firms in China.

Marshalling World Opinion

Or, we can postpone the inevitable by encouraging Mr. Stimson to write further notes and convey in no unmistakable terms our determination to hold Japan to strict adherence to the treaties and refuse to recognize whatever she may do in China. We can concentrate upon marshalling world opinion against Japan through propaganda that will alienate sympathy, blacken her character and leave her without a friend, preparatory to resorting to more drastic measures.

This procedure is now a recognized adjunct to modern diplomacy in anticipation of war, one of the most powerful weapons human intelligence has devised to discredit and isolate a state with which another state may have a disagreement. This weapon broke the German morale and led them to accept proposals for peace which were coldly ignored when they were at our mercy. Germany is now paying the penalty for her credulity. This is a form of warfare in which the Anglo-Saxon excels; one that the Japanese are not proficient in. Their traditional courtesy, reticence, inability to express themselves forcibly and lack of mediums to get their case before the world all operate to their disadvantage. Confronted with this type of warfare the Japanese are powerless.

We are now in that initial stage of hostilities with the American press so violently anti-Japanese that no explanation can justify Japan's actions in Shanghai. Japan is stigmatized as an outlaw, a violator of treaties, a ruthless, cruel, invader of helpless China, murderer of women and children, bomber of unfortified cities, a mad dog that must be killed or incarcerated in the international pound. World opinion is being marshalled against her in deadly earnest. The next step is the boycott. The pacifists and idealists of America egged on by the Chinese and sensational war news from Shanghai are attending to that. Pacific war will then be followed by the real thing.

The American press is working true to form. The heart of America is being fired in the same way it was worked up to the war pitch in 1898 and 1917 and the end is just as certain unless wiser counsels prevail and some attention and consideration is given to Japan's side of the case. For these people have been driven to desperation by the Chinese. In desperation they retaliated and in desperation they will fight for their right to exist.

The End of the Road

If the other Powers are determined to support China in her fixed policy to oust Japan from Manchuria and ruin her financially and economically; if China's inability and unwillingness to discharge her duties as a state are to be encouraged to the point where Japan's existence is jeopardized; if China cannot or will not defend her neutrality in regions where Japan's national security is at stake; if China is to be freed from all responsibility for her acts; then we have reached the end of the road. There is nothing left but to carry the pacifist war to its logical conclusion. Apply the boycott and order the American battle fleet to do its duty. But, if the American fleet is not able to force the Loochoo and Pescadores barriers; if perchance, it should be repelled, scattered, crippled or defeated by the Japanese air fleet, mine fields and submarine squad-

rons, American influence in the Western Pacific would disappear forever, China would be dominated by Japan and the Philippines become a Japanese colony. If, on the other hand, victory should go to the American navy, we would become the foremost power in the Far East, the guarantor of a **pax Americana** that could be enforced only by converting Manila or some Chinese port into a mammoth naval and military stronghold in preparation for a war with Russia that would then become as inevitable as the one with Japan. To maintain this peace we would have to ally ourselves with China and pour our wealth into this bottomless sink of corruption and ineptitude in the hope that in time the Chinese would become strong enough to relieve us of this burden, and defend their territorial and administrative independence in accordance with a policy we have laid down as the unchangeable law of Asia. American victory in a war with Japan would compel us to retain in the Far East a battle fleet two or three times bigger than Japan's in order to enforce our terms of peace and defend China against all other violators of the sacrosanct Open Door Doctrine and Nine Power Treaty.

With Japan prostrate, we could then call to the colors the youth of the nation, mobilize our army, charter all the available transports in the world to dispatch a few millions of our sons to Mongolia and have it out with the Soviet for its contemptuous violation of the same principles that led us to smash Japan. To be consistent and live up to our conception of national honor, dignity, self respect and treaty rights, we could not remain quiescent while any one nation challenged our basic Far Eastern policy. In all fairness to ourselves, to our traditions, and to our posterity, we would have to fight Russia.

The cost of preserving the peace of the Far East and perpetuating our policies as the result of a victorious war with Japan, would be many times greater that the cost of waging that war. If we win, we lose. But that is nothing, a mere bagatelle to the American pacifist. We must, at all costs, uphold and defend our principles. We have the money, we have the men, we have the industries; all we need to get started are a few more diplomatic notes, a little more firing of the American spirit, another burst of anti-Japanese propaganda, a little more marshalling of world opinion against Japan and we will be launched on the glorious crusade to uphold the sanctity of treaties, to make Asia safe for Bolshevism and our Great Sister Republic free to develop along lines that will make her worthy of becoming our Ally in Asia, the Standard Bearer of those principles of Democracy upon which our hopes of a better world are built.

There are enough slogans embraced in these high-sounding ideals to stampede any nation of philanthropists into taking up arms for their enforcement. We are travelling the same road that led us to hostilities in 1898 and 1917.

America Cannot Fight Japan

Pricking the Washington Bubble

LET us return to Secretary Stimson's open letter to Senator Borah and the warning conveyed in his reference to the fortification of the Philippines and Guam and America's surrender of her commanding lead in battleship construction. He says:

"It must be remembered also that this treaty was one of several treaties and agreements entered into at the Washington Conference by the various powers, and all of which were inter-allied and inter-dependent. No one of these treaties can be disregarded without disturbing the general understanding and equilibrium which were intended to be accomplished and effected by the group of agreements arrived at in their entirety. The Washington Conference was essentially a disarmament conference aimed to promote the possibility of peace in the world, not only through the cessation of competition in naval armament, but also by the solution of various other disturbing problems which threatened the peace of the world, particularly in the Far East. These problems were all inter-related. The willingness of the American government to surrender its then commanding lead in battleship construction and to leave its positions at Guam and in the Philippines without further fortification, was predicated upon, among other things, the self-denying covenants contained in the Nine Power Treaty, which assured the nations of the world not only of equal opportunity for their eastern trade, but also against the military aggrandizements of any other powers at the expense of China. One cannot discuss the possibility of modifying or abrogating those provisions of the Nine Power Treaty, without considering at the same time, the other premises upon which they were really dependent."

Mr. Stimson's statement would seem to imply that the United States in surrendering its right to fortify Guam and the Philippines had made great concessions to establish peace in the Pacific, omitting however to refer to Japan's equal, if not greater sacrifices to the same end. The agreement to maintain the **status quo** as to naval bases in the Pacific did more to preserve peace and the "open door" policy than the reduction in battleship tonnage. When Japan surrendered her right to fortify the Bonin Islands, the Kurile Islands, the Oshima group, the Loochoos, Formosa and the Pescadores, she gave a guarantee that American commerce with the mainland of Asia could be carried on without fear of interference. In fact, the maintenance of the "open door" for American commerce through the screen of Japanese islands encircling the Yellow and China Seas, became the basic issue between the United States and Japan.

In 1921, America was preparing to convert the island of Guam into a great war haven and equip Cavite with docks and magazines for her battleship fleet. Japan was fortifying the Bonins, Oshima, the Loochoos and the Pescadores. In the event of war between the United States and Japan, which then seemed a possibility, American commerce, bereft of its usual trade routes to the Orient through the ports of Japan would have to pass through the Loochoo chain or hazard the passage of the narrow Formosan Channel from the south under the guns of the Pescadores forts, and with all channels guarded by Japanese submarines and mines. Japan controls every trade route between America and Central and North China and in the event of war, American vessels would have to run the gauntlet through a series of fortified and mined Japanese Panama Canals swarming with submarines and destroyers and protected by aeroplanes. With two hundred submarines, Japan could effectively close the Yellow and China Seas to the combined navies of the world and, if the battle fleets of an enemy should succeed in breaking through this cordon, they would then meet the formidable Japanese battle fleet in its own waters. The outcome of such a battle is largely a matter for conjecture. No naval authority has yet had the temerity to hazard a prophecy as to the outcome.

Cards on the Table

When Major-General Leonard Wood had his round-table talk with the war-chiefs of Japan in Tokyo during the month of September 1921, he told them that the United States would go to war if they persisted in fortifying the outlying chain of islands that at any given moment might stop or interfere with American commerce with China. Baron General Tanaka, speaking for Japan, told General Wood with equal frankness that if any nation interfered with them in Manchuria, they would fight. This was the irreducible minimum for peace on both sides and with the informal understanding arrived at during this historical interview, Japan accepted President Harding's invitation to attend the Washington Conference, conditioned on elimination from the agenda "of problems such as are the sole concern to certain particular powers, or such matters as may be regarded as accomplished facts"—meaning, Manchuria.

Japan cheerfully agreed to stop the fortification of the Bonin, Kurile, Oshima, Loochoo and Pescadores Groups and Formosa,

thus assuring to American commerce the "open door" to the Asiatic mainland while retaining the commercial advantage of having American ships pass through her own main ports of call, Yokohama, Kobe and Nagasaki. It may be that the United States sacrificed more than Japan in surrendering her right to fortify Guam and Manila Bay. That is also a matter of opinion. The fact remains, however, that if the treaty is not renewed and we return to the pre-Conference situation, and Japan embarks on a new defense program fortifying the outlying islands commanding the ocean lanes to the mainland of Asia and concentrates on submarine and aircraft construction, it would compel the United States to revive its discarded naval program, complete the fortification of Guam and the Philippines or enter into some understanding with Great Britain for the use of the Singapore Base.

Great Britain would have to increase her fleet or see her Pacific Dominions turn to the United States for protection. Even at that, the Japanese program if carried out, would tax the combined American and British fleets to break through the cordon of fortified islands, mines and submarines guarding the channels to get at the main Japanese battle fleet waiting inside the barrier. On the result of such a battle would hinge the future of Western Civilization. If such a war is ever fought, it will be over a nation whose disorganization and absence of government has embroiled the world in its disputes.

Problems to Consider

Only on the premise that the national honor and security of the United States is involved in the permanent retention of a group of islands to whose people we have promised ultimate independence, can our sacrifices to preserve the peace of the Pacific overshadow Japan's surrender of her right to fortify a chain of islands as essential to her security as the approaches to the Panama Canal are to the United States or the All-Red-Route to Great Britain.

At least one-half the people of the United States are committed by the pledges of the Democratic Party Platform to concede immediate independence to the Philippines ; the other half, represented by the party in power, are unwilling to surrender this strategic foothold in the Far East under the plea that our continued occupation of the Islands is necessary for purely strategic reasons to uphold the "open door" in China. Independence of the Philippines therefore becomes subordinated to a policy which has no reference to the legitimate aims and aspirations of the Filipino people and which we can enforce only by converting the Islands into a gigantic naval and military outpost.

The Philippines are the Keys of Empire. The United States is the keeper of these keys, the guarantor of the Islands' neutrality. As long as the United States remains in the Islands, Japan is assured against attack from that direction. She opposed no objection to our taking over the Islands in 1898 and is content to see us remain there. But if the Islands are ever converted into a base for the maintenance of a fleet for the enforcement of policies inimical to Japan's security, the picture will be reversed. We would have to fight.

The " open door" for American trade with China is contingent upon Japan's self-denying clause in the Naval Treaty concerning the fortification of her outlying islands. Abrogation of the treaty would be followed by immediate resumption of work on these defenses with corresponding activities in Guam and Manila in preparation for a war that would then become inevitable.

The American fleet would still face the problem of how to break through the cordon and maintain the " open door" for a trade that has grown to its present proportions largely through the investments and co-operation of the very nation we would fight over a doctrine that survives as a force in Eastern Asia because Japan staked her existence in 1904 to uphold it.

America would not go to war with Russia in 1904 over the "open door" in Manchuria. We left that to Japan, and her interests there, both economic and strategic, have since become essential to her existence as a state. America would not go to war with Russia, or even protest, over the closing of the door in Mongolia. This job will also have to be done by Japan whose interests in those regions have now become paramount. If we challenge and thwart her aspirations or interfere unreasonably with her predominance in these areas, we will do well to recall what General Baron Tanaka said to Major-General Leonard Wood.

Lessons of History

Russia's uncompromising insistence in the pursuit of a policy that menaced the security of Japan, ended with her elimination as a Far Eastern power. China's secret diplomacy which forced the war of 1904 ; her refusal to admit responsibility or acknowledge Japan's sacrifices in restoring her lost sovereignty over these territories ; her determination to drive Japan out of Manchuria by fair means or foul and expose her once more to the slow, steady relentless pressure of the Slav seeking his warm-water goal ; coupled with a propaganda of hate, distortion of facts and disregard for the amenities of international relations, has ended in the same way. The war-lord of Manchuria has lost his job. For the first time in their long history, the people of Manchuria are to be given a voice in choosing their own government. Manchuria will remain a Chinese state, but it will never again be permitted to jeopardize the security of its powerful neighbor.

This is Japan's business in which the rest of the world, has no right to interfere. America's only interest in this area is the maintenance of the " open door" under the most favored nation treatment. Whatever settlement Japan may make which does not impair our open door rights, is emphatically none of our business. Should American diplomacy thwart Japan's exercise of her legitimate rights of self-defense in these regions it would lead to grave consequences. Unless the people of the United States are willing to view the Manchurian problem from the same angle that they interpret their duties and rights under the Monroe Doctrine, they cannot expect the Japanese to bend to their will or submit to any outside dictation where their right to exist is involved, nor would they be deserving of our respect if they did.

Many American believe that we must fight Japan to uphold our conception of the Hay Doctrine now incorporated in the clauses of the Nine Power Treaty. That war, however, will never be fought. Unless we lose our reason and assume the offensive it cannot be fought. Whoever takes the first step in such a war will enter upon an adventure that will drain the resources of both sides in a long drawn out sanguinary conflict that must end in a stalemate. Before advocating those initial pacific measures that will provoke open hostilities, it would be well for our pacifists, unreasoning Chinese sympathizers, boycott enthusiasts and war-yappers to remember that as matters now stand, Japan is well nigh impregnable to a direct attack, safe against aggression from the sea as long as she maintains an efficient fleet.

Factors in the Situation

Japan does not require a battle fleet equal to that of America for her defense, but America needs a battle fleet at least three times bigger than Japan's to assume the offensive. With two hundred submarines, or perhaps with her present undersea fleet, and air force, if certain channels are guarded by mines, Japan could close the Yellow and the China Seas to the combined fleets of the world. Before the United States could even contemplate going to war in the Far East, we would have to throw overboard all our pacific policies, build a fleet at least three times as powerful as that of Japan, convert Manila into the Gibraltar of the East, erect huge munitions and oil storage plants and announce our intention to hold the Philippines as a permanent possession. Even after this enormous initial expenditure, it would avail us little if Japan at much less cost doubles or trebles her submarine defenses and fortifies the Loochoo and Pescadores barriers.

No American army can cross the Pacific and break through this barrier unless it is allied with Japan. Under such conditions, it is obvious that the American people are not going to engage in a racial conflict to please the Chinese.

Armed intervention of the United States in the present situation as urged by prominent Chinese leaders after reading Mr. Stimson's open letter to Senator Borah, is not very complimentary to our intelligence. When these fundamental facts are digested by the Chinese and those Americans endowed with a bellicose imagination founded on a misconception of existing strategic conditions, there is some possibility that the Chinese will realize that their old game of playing one power against another is finished. America does not intend to fight China's battles, no matter how many notes Mr. Stimson may write restating our policy in the Far East.

The Blunders of 1921

THERE was just one mistake made at the Washington Conference. The omission of Russian delegates and the failure of Moscow to subscribe to the principles of the Nine Power Treaty renders impossible the faithful carrying out of that agreement by any Signatory exposed to the full effect of Soviet policies.

In 1921, when President Harding issued the invitations to attend the Conference, Russia was prostrate. It was generally accepted by the other Powers that she was finished for a generation. It was for that reason that Great Britain and Japan were disposed to scrap an alliance that had stood for twenty years as the sole guarantee of peace in the Far East and accept the Four Power Treaty in its stead.

Japan surrendered an alliance that carried with it armed support against the only enemy she had to fear, in exchange for an inocuous pact guaranteeing her against war with a nation she had no quarrel with and who could never become a real menace to her existence. Japan surrendered her one guarantee of security in Asia in order to placate America and relieve Great Britain from an encumbrance that stood in the way of Anglo-American co-operation in world affairs.

What more could the United States ask of Japan? What further proof could she give of her sincerity and desire for friendship? Had the position been reversed and France or some other powerful Western nation been asked to surrender its one real security in exchange for a paper agreement providing for a talk-fest with other nations over matters which had no bearing on her vital problem of defense, the Conference would have witnessed a display of Gallic pyrotechnics that would have terminated its usefulness in short order. When the Anglo-Japanese Alliance went into the discard, the British confidently anticipated that it was the first step towards the consummation of a hope that would more than compensate them for throwing overboard their old partner in Asia. These post war hopes, like the security pact with the United States that France set her heart upon, have never been realized. They never will be. The British gave up a bird in the hand for a bird in the bush. They are now paying the penalty for it in India. All they have is a hamstrung League of Little Nations, with France, the only big power that can help enforce its decisions, opposing them at every step. In pursuing a will-o-the-wisp, Great Britain has isolated herself and faces alone, with little sympathy from the other powers, the herculean task of preserving her prestige and position in India.

As long as the British co-operate with the United States to uphold the open door in China they can count on American friendship, but the sentiment begins and ends right there. The people of the United States are not concerned with Britain's century-old fight with Russia in Central Asia, nor with Japan's efforts to defend herself against the same menace. That is emphatically none of our business. Our interest in Asia is to preserve China intact and we demand that the rest of the world stand with us in upholding a policy which in its strategic ramifications has little regard for the vital interests of others.

Some day to be consistent and honest with ourselves, we will have to intervene in Tibet, the real Holy Land of Buddhist China and restore to China her untrammelled Sovereignty over this region. Britain will have to get out or fight.

How Japan was Isolated

In order to stop Japan from consolidating her position in Eastern Asia, the other Powers, led by the United States, combined to strip her of her defenses. The fight over the Consortium program simmered down to bringing pressure to bear upon Japan to surrender her right to the Taonan-Jehol railway, even after Viscount Chinda, the Japanese Ambassador at London, revealed that the object of this line was to defend both China and Japan against "**the menace from the direction of Urga.**"

Without authorization of Congress and for reasons which have never been explained to the nation, President Wilson sent an American army to Siberia. It is now clear that the object of this expedition was to prevent Japan from securing a slice of territory as compensation for her occupation of Vladivostok and taking over the Trans-Siberian Railway in behalf of the Allies. After squandering a billion gold yen in her Siberian adventure, Japan was compelled to withdraw under the terms of her commitments with the United States. Then came the abrogation of the Anglo-Japanese Alliance.

Had the Consortium program, Allied Intervention in Siberia and the cancellation of the Anglo-Japanese Alliance been conceived and carried through by Moscow, it could not have done a better job. For, with Russia outside the League and non-signatory to the Nine Power Treaty, she can do as she pleases in Asia. The Japanese Foreign Minister recently characterized China as a "**chartered libertine**" but the lawlessness of China, bad as it is, cannot be compared with the menace to Asiatic peace, when the Bear was unchained and set on the prowl by a series of international agreements designed to hold Japan in her place. As Japan walked into the trap, the Bear walked out and ever since has been sharpening his claws and growling his way towards his impotent victims.

Lack of Foresight

There is only one justification for the series of diplomatic blunders which culminated in the Nine Power Treaty. That justification, found in the principles underlying the treaty itself, is based squarely on the assumption that China was worthy of the confidence reposed in her and would carry out her international obligations. The rapid recovery of Soviet Russia into a formidable menace with an army of nearly a million men, her Five Year Plan, her annexation of Mongolia, her plans for further penetration and conquest by railway, her huge steel mills in the Altais and other evidences of a renewed virility and a determination to adhere to the traditional policies of the race, were not foreseen in 1921. Neither did the Powers assembled at Washington anticipate that within a few years China would be allied with Moscow, with Soviet agents directing her foreign policy, leading her armies to war against the capitalist and imperialist nations and planning to capture and use Shanghai as the Far Eastern headquarters of world-revolution. They could not envisage the complete overthrow of the Peking militarists and the ascendency of a Nationalist Government of China based on the dictatorship of a party similar in every respect to the Soviet system and with the Left Wing of that party working hand in glove with Moscow.

They had no prescience of the complete collapse of government in China, the communization of whole provinces, the devastation, misery and enormous loss of life, the growth of a vampire military system that has sucked dry the life-blood of the people, the arrogant campaign for the abrogation of so-called unequal treaties and rights recovery that culminated in the unilateral abolition of extra-territoriality and a demand for the surrender of Shanghai. Nor was the conference foresighted enough to understand that China would live up to her threats to reopen the issue of Manchuria on every appropriate occasion; that she would refuse to recognize the 1915 Treaty, call upon Japan to get out of Liaotung in 1923 and make this a condition upon which a new treaty of commerce and amity would be based.

All that Washington saw was a prostrate Russia so unimportant as a factor in Far Eastern affairs that she was not even invited to attend a conference that set out to establish a **status quo** in this part of the world similar to the one created for Europe at Versailles. The Conference was concerned solely with clipping the wings of Japan and setting China upon her feet in the hope that she would be able to take care of herself within a reasonable time.

Japan's Vital Problems Ignored

The Conference gave no heed to Japan's vital problems. There is only one vulnerable section in Japan's strategic position and that lies along her Korean land frontier and in Manchuria. Like the British frontier in India, it calls for defense by an army having free sea communications and accurate information as to what is happening in Afghanistan, Persia and Central Asia. Japan's defense is equally dependent upon a full and accurate knowledge of what is transpiring in Mongolia and along its border lands. The

joint in Japan's harness can be threatened only by a first class military power established in Asia, and that one power is Russia. Unless China is able to defend its own territory, discharge its duties as a neutral and in other ways comply with her obligations as a sovereign state, then Japan's security is imperilled and she has the unquestioned right to take such measures as she deems necessary to protect herself.

If Japan's actions in Manchuria violate the League Covenant, the Nine Power Treaty and the Kellogg Pact it is because these instruments for the adjustment of world disputes apply only to China's side of the case and fail to cover the larger issues involved in the menace "from the direction of Urga," which the weakness, ineptitude or connivance of China has permitted to develop to a point where unless Japan acts now to protect herself, in another year it will be too late. If the world objects to Japan defending herself, there is always the alternative of guaranteeing her security against the menace that looms just over the Mongolian border. In the first place, it is highly improbable that the other Powers, especially the United States, would guarantee to Japan what they have refused to France, and in the second place, even if they did, their armies could never get here in time to be of any use in Manchuria. From every angle, Japan's security depends entirely upon her own freedom of action and her right to resort to self-defense without being challenged.

If the Nine Power Treaty is sacrosanct, if China is to be permitted all the time necessary to work out her own salvation, while Japan is dragged down to economic ruin and her strategic position undermined, then the duty of the other Signatories is clear. Either they must intervene to compel an immediate cessation of civil warfare in China and the establishment of a unified government that can discharge its international obligations under the provisions of the pact, or, stand aside and refrain from criticism while Japan resorts to the same measures to protect herself, in the same manner the United States and Great Britain would exert that right under similar circumstances.

It is folly to accuse Japan of taking advantage of China's troubles and world unrest in order to advance her own interests. The world, that is, the League and the United States, is concerned solely with the explosive situation in Europe. In bolstering up Germany, the major powers have alienated the friendship and sympathy of France, who with a profound prescience of what the future holds out, rejects any plan for further disarmament which does not include some guarantee from Britain and the United States of armed assistance. France places no confidence in the sincerity of the old Central Powers and in enforcing her viewpoints, has precipitated the economic débâcle in Germany, broken the financial power of Britain and brought the realities of the situation home to the American bankers who have been carrying Germany and making possible her payments of reparations to date. France is fighting for her life, waging a war within the peace pacts just as deadly and disastrous for her antagonists as though her armies were in the trenches.

While Europe is being torn asunder over the security of France, is Japan to be laid open to the same menace and denied the right to defend herself, simply because the rest of the world has got in such a jam in Europe that it has no time or inclination to consider Far Eastern problems? France, fortunately for herself, can fight her battles with bullets of gold. With Gallic fluidity of language, supported by a group of voluble allies and subsidized states she can command respect for her viewpoint in the forum of the League and at other international political gatherings.

France is teaching the world the lesson that no pacts, agreements, covenants or understandings, no matter how sacred or binding, will be permitted to stand in the way of a powerful, determined nation when, in its opinion, its security is threatened. The other Great Powers apparently do not agree with France, so, in her own way France has declared war. On the outcome of the war now being waged in Europe, hinges the future of the League and world peace. Faced with the same problem, but with the menace more imminent, Japan has no immense reserve of gold, no gifted orators to present her case, no allies or friends to support her in the forum of the League. She stands alone, isolated, stripped of her defenses and her right of self-preservation. Japan's only weapon is her army and navy and the right to use them in self-defense. In desperation she has been compelled to invoke this basic law. The fault, if any, lies not with Japan, but with the Powers and the League which after laying down rules, regulations and principles for the preservation of world peace cannot enforce them against one nation which openly defies and laughs at the rest of the world and against another, whose inability to discharge its duties as a state and whose insincerity in matters connected with Russia, has compelled Japan to take the law into her own hands.

An Indictment

"I do not know how to draw an indictment against a whole nation," said Edmund Burke a century and a half ago. Chiselled deep in the granite of immortality his words remain to remind us that in the present controversy—war, if you will—between China and Japan, it is difficult to indict all China or all Japan. There are two Japans, but there are also two, three, or four Americas, Britains, Germanys and Frances. There is a military Japan that faded into the background after Versailles and definitely went into the discard after the Washington Conference, giving place to a Liberalism marching in step with the rest of the world, pledging the nation to peace, conciliation and good-will.

In the last decade, Liberalism in Japan has produced statesmen and leaders as idealistic and sincere as any that have come to the fore in the United States or in Europe. Some of these men even overshadow their contemporaries in other countries. Their job was harder; they had more to strive for, more to lose. They pledged the nation to peace and good-understanding and in doing so signed away its right of self-defense, confident that the rest of the world would recognize their sacrifices and help them to find a solution to their fundamental problems.

The decade following Versailles and Washington witnessed a complete revolution in the foreign policies and outlook of Japan. Bankers, business-men, politicians and statesmen, all worked together to bring about better relations and co-operation with the United States and, despite the irritation caused by the Exclusion Act, the old traditional friendship between the two nations was placed on a firmer basis. Never in modern history, have two nations estranged by political misunderstandings come together in such complete accord as the United States and Japan in such a short space of time, proving, if such proof were needed, that there were no fundamental points of dispute between them.

For the past decade, Japan has been almost a preferred market for American machinery, engineering supplies and raw materials of all kinds. They came to us to revolutionize and build up their industrial system in order to provide employment and absorb a rapidly mounting population that had no outlet. For over a decade, the process of Americanizing modern Japan has been going on apace, until to-day the business sections of her important cities are replicas of Main Street and her mills and factories as far as possible are equipped with American machinery and operated along American lines. Americans have had their day in Japan and reaped enormous profits.

Ten years ago, twenty-three per cent of Japan's trade was with the United States and forty-five with China. To-day, the picture is reversed, with over forty per cent of her trade with the United States and twenty-three with China. At least forty per cent of American exports to China passes through Japanese firms, destined in large part for Japanese-owned enterprises in this country.

When to this is added the value of the raw and partly finished American materials imported into Japan and exported to China in the shape of manufactured products, it will be found that Japan sells twice as much American products to China than all the American firms engaged in this business.

In dollars and cents, Japan's part in American trade with China is roughly $100,000,000. She is not only our best customer in Asia but our best middleman in China. China's severance of economic relations with Japan is automatically followed by a corresponding decline in American trade with both China and Japan. In ten years, Japan has become the commercial partner of the United States in the Far East and any disturbance of these close economic ties must react on the prosperity of the nation from which she derives such a large part of her raw and partly finished materials.

While the Liberals of Japan were co-operating in good faith with the other great Powers, signing treaties and abiding by their provisions, even when they seemed inimical to their interests, concentrating all their energies on the arts of peace in order to solve their basic population and economic problems, the menace to their security from the mainland of Asia was permitted to grow to such alarming proportions that unless something was done to counteract it, the labors and sacrifices of a decade would go for naught.

In these ten years, Japan witnessed a prostrate Russia build itself into a more formidable power than it was at any time under the old régime. She saw the Soviet reach out and absorb Mongolia, parallel the western borders of China with new strategic railways, enter into a Five Year Plan which embraces steel mills, metallurgical plants, railways and industries in Asia, she saw the little Red Army grow to nearly a million men and the creation of a special Far Eastern army based on Chita and Irkutsk free to use Mongolia as a screen for its movements and as a broad highway to flank their position in Manchuria and menace their security.

Japan saw a revolutionary China under a Magna Charta of freedom to do as it pleased, develop along lines diametrically opposed to the principles upon which her new liberties had been predicated. Instead of a reduction in her military forces agreed upon as one of the conditions to her new status, Japan saw these armies expand from a million and a half to three million men, with another two million armed bandits and communists forming an inexhaustible reserve for the main forces.

Japan disarmed, surrendered her security on the mainland and prepared for peace in the same way that the United States surrendered its commanding lead in battleship construction at Washington because of the inter-related self-denying clauses of the Nine Power Treaty. Japan predicated her security and freedom from aggression on the same premises that the United States did. In ten years however, of the Nine Power Treaty and its inter-related resolutions, she has seen her little army of 230,000 men outnumbered nearly thirty to one by the combined Soviet and Chinese forces. The premise that the Chinese won't fight was used as a pretext to justify this possession of a huge army, but that premise is now knocked into a cocked hat. This Chinese army has been used to support a program on the part of its leaders for the recovery of all rights, the abolition of extra-territoriality, the taking over of Shanghai and other foreign concessions and to drive Japan out of Manchuria, ruin her economically and undermine her security.

Can we indict the military party in Japan for making an effort to defend the nation against this constantly growing menace ?

Can we indict China as a whole for what has happened ? It is impossible to indict the Chinese people or hold them responsible for the actions of a so-called government in which they have never been permitted to have a voice either in the selection of its personnel or in the formulation of its policies. The great mass of peaceful, kindly, hard-working Chinese are concerned solely with their struggle for existence, looking ahead from one day to the other to where they can fill their rice-bowl. They know nothing and care less about politics, either domestic or foreign. They are slaves to a system, more ruthless in its oppression and more callous of their welfare than anything recorded in ancient or modern history.

No, we cannot indict the Chinese people as a whole, but we can indict those who have brought this misery upon them. We can indict the war-lords, their spokesmen, their henchmen and their paid foreign propagandists who have perpetrated this crime against a patient, long-suffering, defenseless and inarticulate people and defend its perpetuation as essential to the creation and development of a stable government that will meet the requirements of the sacrosant Nine Power Treaty. We make that indictment and hold the League and the Signatories to the Nine Power Treaty directly responsible for the crimes that have been committed against Humanity under the aegis of their protection.

Electrical Developments in the Philippines

The Legislature of the Philippines has approved the following measures to install, operate and maintain electric plants :

An Act granting to Miguel Perez a franchise to install, operate, and maintain an electric light, heat and power plant in the Municipality of Pontevedra, Province of Occidental Negros, Philippine Islands.

An Act granting to Lucila San Jose a franchise to install, operate, and maintain an electric light, heat and power plant in the municipalities of Gerona and Pura, Province of Tarlac, Philippine Islands.

An Act granting to Lucila San Jose a franchise to install, operate, and maintain an electric light, heat and power system in the municipality of Ramos, Province of Tarlac, Philippine Islands.

An Act to amend Act numbered thirty-eight hundred and one, entitled " An Act granting to the Imus Electric Company, Inc., a franchise to install, operate, and maintain an electric light, heat and power system in the municipality of Bacoor, Province of Cavite, Philippine Islands."

An Act granting to Roman Baluyut a franchise to install, operate, and maintain an electric light, heat and power plant in the municipalities of Apalit, Macabebe, Masantol, San Simon, and San Luis, Province of Pampanga, Philippine Islands.

An Act granting to Teofilo M. Pereyra a franchise to install, operate, and maintain an electric light, heat and power plant in the municipality of Tangub, Province of Occidental Misamis, Philippine Islands.

An Act granting to Davao Telephone Company a franchise to install, operate, and maintain a telephone system in the Province of Davao and any municipality or municipalities thereof.

Osaka Plans Tube System

A Y.1,000,000 tube beneath the riverbed of the Ajikawa, Osaka, between Minami-Ajikawadori Itchome, Minato-ku, and Kita-Ajikawadori Itchome, Konohama-ku, at a point known as the Gempei ferry, will become a reality before long, providing the Osaka Municipality approves the plan recommended by the Japan Civil Engineering Society.

The plan calls for laying a steel tube, overlapped by reinforced concrete, 252 feet long, 34 feet wide and 20 feet high, beneath the riverbed, the interior of which tube will be supported by several pillars, flanking the edge of a 24 foot driveway in the center.

At each end of the tube will be three elevators, two being for vehicular traffic which will be carried down to the tube level, about 40 feet below the ground surface. When completed, Osaka will boast of the only tube of this kind in the country.

" The City expects to receive the final plans and specifications from the Society shortly " said Mr. Shimamoto, head of the City Civil Engineering Section, " and then we shall probably approve the scheme, inasmuch as the experts favor the tunnel idea rather than a bridge, which would hinder water-borne traffic, unless it had sufficient clearance.

" One stumbling block is that the City has not sufficient appropriation, and for this reason if we approve the plan at all, we shall probably have to take recourse to the city planning scheme in its second stage."

The need for an adequate traffic medium at the Gempei ferry has of late become increasingly acute, due to the steady development of the Kujo district, flanked by the Ajikawa. Yet, because of the heavy water borne traffic, the City has always hesitated to span the river, since any bridge with sufficient clearance, would cost an enormous sum of money.

Takuma Dan

STRUCK down without warning by a waiting assassin, Baron Takuma Dan, Director-General of the House of Mitsui, pays the penalty of leadership. Words are vain to express the sorrow and despair that comes over those who knew him, for to know him, was to love him. Coming so quickly after the dastardly assassination of Junnosuke Inouye, another of Japan's great Liberal leaders it gives pause for reflection.

Takuma Dan personified his country in its highest and noblest traits and traditions. He was, in every respect, one of God's own Noblemen, a type that is fast disappearing in the world of to-day. Rising from the very bottom of the ladder to the highest rung in the commercial and financial life of his country and guiding its policies by his liberal and humanitarian counsels, Baron Dan was the Oriental counterpart of that type of self-made man, who in such large numbers have risen to the top in the United States. But unlike the forceful, positive, American type, Takuma Dan was the direct opposite, unassuming, self-effacing and gentle to an incredible degree. But behind these characteristics that nature endowed him with, were those other qualifications which came as the result of hard study, application to work, mastery of his profession and efficiency in administration that elevated him to the highest executive position in Japan, if not in the world. For the Mitsui organization has no equal in mercantile history since the passing of the East India Company.

As Director-General of the Mitsui Gomei Kaisha, the central holding company of the Mitsui interests with their ramifications into every conceivable line of commerce, industry and finance, Baron Dan was the head of a business upon whose success depended in large part the prosperity of the Empire of Japan. Mitsui and Japan are one. They are synonymous. Should the House of Mitsui fail, it would precipitate a national financial crisis that would be felt around the world. The man upon whose shoulders devolves the task of directing the affairs of the Mitsui organization carries a responsibility greater than any captain of industry in other countries and a far weightier obligation to the nation than any of its official representatives. It is a job that calls for talent, tact and tenacity of the highest order.

With the passing of Junnosuke Inouye and Takuma Dan, Japan loses two of her outstanding leaders, whose counsels have guided the nation along the paths of peace and understanding with the rest of the world, especially with the United States. Both were perhaps better known in America, where Japan's trade and financial interests were predominant. American financiers and business men reposed faith and confidence in these leaders of modern Japan who paved the way for that co-operation that now stands as the surest guarantee of peace in the Pacific. The labors of these men have done more to cement relations between the two nations than any limitation of armaments or treaty pledges to maintain peace or the "open door". Politicians and statesmen may take the credit for the diplomatic moves, the notes, resolutions and the formal treaties which document the Washington Conference and the Peace Pacts, but the implementation of these instruments through close financial and commercial ties and the will to peace, is traceable on this side of the Pacific to the group in Japan headed by Junnouske Inouye, Takuma Dan, Eiichi Shibusawa, Kijuro Shidehara and other Liberals who clearly foresaw that a perfect understanding with the United States was the foundation upon which rested the future prosperity of their country. The death within three months of three of these great leaders of modern Japan is a loss to the whole world. Others remain to carry on the program but they are growing old and perhaps disillusioned. For the past fifteen years, *The Far Eastern Review* in pursuit of its basic policies to cement the friendship between its own country and Japan and bring about a real co-operation for the realization of their common aims to assist China to become strong and take her place in the family of nations, knows from first hand of the sacrifices for peace and good understanding made by this group of Japanese Liberals. Their counsels have carried Japan to the parting of the ways, gladly subordinating the paramount interests of the nation to the needs of world peace, looking forward with hope and confidence that the world would reciprocate and extend to Japan a helping hand in the solution of problems upon which the continued existence of the nation as a power for peace and stability is based. Their work has been well done. It is an honor to have been associated with them. We pay our deepest respects to their memories and convey our heartfelt condolences to their families and their colleagues who are called upon to carry on.—G.B.R.

Baron Takuma Dan

The Construction Industry in the United States

The National Conference Operates to Consider Improvement of Conditions through Intergroup Action

By JOSEPH H. EHLERS, Technical Director National Conference on Construction

An interesting effort has been under way during the past year in the United States to consider some of the problems harassing the business and professional interests related to construction. The many business groups concerned, including contractors, engineers, architects, materials suppliers, bankers, surety, insurance and real estate groups have set up committees to report on outstanding problems with recommendations for action to a conference which will be called later to consider putting the proposals into effect. This group effort is designated the National Conference on Construction.

It was organized early in 1931, at the suggestion of leaders in various branches of construction activity in an effort to bring about co-operation between the various trade and professional associations on long-range problems concerning the industry, including stabilization of its operations. Secretary of Commerce Lamont is serving as General Chairman, and Mr. Julius H. Barnes, Chairman of the Board of Directors of the United States Chamber of Commerce, is Chairman of the Executive Committee.

In general the purpose of the Conference is to provide a continuing agency: (1) to review the outstanding common problems of the interests identified with public and private construction; (2) to select a limited number of such problems which will lend themselves step by step to constructive intergroup action; (3) to develop the necessary factual studies of such problems; (4) to agree upon recommendations to be made to the co-operating agencies —public and private, and including the national trade associations and the local building congresses,—looking toward the solution of such problems.

After a careful study of past unsuccessful attempts at providing for intergroup activity in the construction field, it was decided that no general conference meeting should be called until a thorough study of various problems had been made through five special committees, each one representative of the various businesses and professions involved in construction. These committees, which have been meeting for several months, are as follows: (1) a committee to examine the statistical and trade information pertaining to the construction industries, under the Chairmanship of S. L. Andrew, Chief Statistician of the American Telegraph Company; (2) a committee to consider the elimination of wastes and undesirable practices, under John W. Harris of the Hegeman-Harris Company; (3) a committee on realty finance under Louis K. Boysen of the First Union Trust and Savings Bank of Chicago; (4) a committee to study local organizations designed to represent comprehensively the construction interests, under Ernest T. Trigg, President of John Lucas & Company; and (5) a committee to study general economic relationships in the construction industry, under A. J. Eken, of Starrett Brothers and Eken. The members of the special committees were selected on the recommendation of the secretaries of the trade associations interested. Other committees may be set up as required.

Most of the trade and professional associations in the field are co-operating, including the leading associations in the contracting, sub-contracting, architectural, engineering, materials supply, real estate, investment and mortgage banking, surety and insurance groups. It was felt desirable to include the financial interests because of the belief that they can exert great influence in the control of construction operations.

The Conference is also co-operating closely with the various building congresses throughout the country, feeling that the creation of better conditions in the building field is in many cases primarily a local matter.

The Executive Committee of the Conference consists of the following twenty-five representative leaders in the construction field, including users of construction:

Benjamin Affleck, President, Universal Atlas Cement Co.

John W. Blodgett, Chairman, Blodgett Co., Ltd.

Luis K. Boysen, Vice Pres., First Union Trust & Savings Bank, Chicago.

W. W. Campbell, Pres., National Builders' Supply Association.

William F. Chew, The Wm. F. Chew Company.

Luis K. Comstock, L. K. Comstock & Company; President, Electrical Guild of North America.

Frederick Ecker, Pres., Metropolitan Life Insurance Co.

Homer Gard, Pres., The Journal Publishing Co., Hamilton, Ohio.

Walter S. Gifford, Pres., American Telephone & Telegraph Co.

A. E. Horst, Henry W. Horst Company; Past-President, Associated General Contractors.

H. S. Kissell, Pres., The Kissell Companies; Past-President, National Association of Real Estate Boards.

Walter Klie, The Smith & Oby Company.

William States Lee, Consulting Engineer, Charlotte, N. C.; President, American Engineering Council.

John G. Lonsdale, Pres., Mercantile-Commerce Bank & Trust Co., St. Louis, Mo.

Lawrence E. Mahan, Ex. Vice Pres., Franklin-American Co., St. Louis, Mo.

O. W. Renkert, Pres., Metropolitan Paving Brick Co.

Robert Ridgway, Chief Engr., Board of Transportation, New York, N. Y.; Past-President, American Society of Civil Engineers.

E. J. Russell, Mauran, Russell & Crowell, Architects; Vice President, American Institute of Architects.

Col. William Starrett, Starrett Bros. & Eken, Inc., Builders; President, Associated General Contractors.

Fenton B. Turck, Jr., Vice Pres., American Radiator & Standard Sanitary Corp.

Morton C. Tuttle, Pres., Morton C. Tuttle Co. Builders.

Harry A. Wheeler, Vice Pres., Board of Dir., First Natl. Bank, Chicago, Ill.

Daniel Willard, Pres., Baltimore & Ohio Railroad Co.

W. M. Wood, Pres., Mississippi Valley Structural Steel Co.

A. L. Worthen, Vice Pres. and Gen. Mgr., The Conn. Quarries Co., Inc.

Reports are being prepared by the five fact-finding committees on a variety of subjects following thorough discussion and presentation of opinion by the various groups represented. The Committee on Statistical and Trade Information has prepared a comprehensive report on the subject of local construction surveys devised to assist in controlling construction, particularly of dwelling quarters and of preventing the excessive construction which leads to later demoralization of values. This report deals with vacancy surveys and other possible information to which the attention of interested local groups should be directed. A standardized form of vacancy

and occupancy survey will be included. It is felt that this may be an important contribution to a better planned direction of building activity.

One report deals with the subject of construction employment statistics, commenting in particular on those gathered by the United States Department of Labor. Another report is considering the census of the construction industry taken in 1930.

The Committee on the Elimination of Wastes and Undesirable Practices has set up four sub-committees to report on certain phases of the following four groups of problems: (1) management and labor, (2) standardization, (3) planning, (4) intergroup relations.

Such subjects as seasonal operations, inspection practices, and advance planning of construction are being given special consideration.

The Committee on Realty Finance decided to report on four matters, including a study of statistical information of interest to financial groups in connection with their construction activities and a consideration of appraisal technique and organization. Certain proposed legislation relating to guaranteed mortgages and uniform mortgage acts will be considered, and some attention will also be given to junior mortgage facilities.

The Committee on Local Organizations has prepared a report embodying a study of local types of organization desirable to represent the construction interests comprehensively in any community and has prepared certain recommendations relating to possible activities of the National Conference on Construction in connection with sponsoring and assisting such local organizations.

The Committee on Economic Relationships has prepared a tentative report dealing with the relationships existing in the building field, particularly those between general contractors, subcontractors, architects, and owners. The subject of bid peddling is being considered, and attention is being given to the matter of pre-qualification of general and sub-contractors.

These reports will first be submitted to the Executive Committee. By preparing well in advance carefully worked out recommendations based on a consideration of the viewpoints of the several groups in the industry, it is hoped that a group can be built up which will be able to consider intergroup problems even of a controversial nature and agree on recommendations for their solution. The intensity of the discussions in these committees has revealed a great interest in the possibilities if intergroup action, as well as the great difficulty of arriving at conclusions which give full consideration to the numerous and sometimes conflicting viewpoints of the several trade groups.

A general meeting composed of official delegates, presidents and secretaries of the various trade and professional associations, including the mortgage banking, materials supply and real estate associations, will be called when a sufficient number of recommendations have been brought forward by the fact-finding committees. This group would presumably meet at intervals thereafter. It is hoped that through these efforts some consciousness of a fundamental community of interest in the construction industries will be developed, and the possibilities of intergronp action as a means of improving existing practices may be impressed upon the various co-operating groups.

The Railways of China

British Interests in State-owned Undertakings

EIGHT years ago it was possible to say of the railways of China that they had been showing, since the establishment of the republic in 1912, steady and almost continuous progress. The remarkable statement was then made, on reliable authority, that the annual volume of accounts and statistics of the railways of the Chinese Republic was unsurpassed in the excellence of its general form by that of any railway system in the world. The information it contained, moreover, told of growing traffic and receipts, and an ample revenue that more than covered an adequate return on capital invested. But all this was changed by the prolonged civil wars. After the death of Yuan Shih-kai, the first President of the Republic, there was no one man strong enough to hold together the forces of the nation, and the various war-lords or provincial generals, who held rule successively over separate districts, fought each other so persistently that internal developments of all kinds were quickly brought to a standstill, and transport conditions fell into a state of chaos.

Actually, the first thing that happened when warfare broke out was the seizure of the main railway lines by the nearest and strongest forces. Hence, disruption and destruction were rampant and almost complete, nor did the partial cessation of internal hostilities which preceded the present troubles with Japan enable any great progress to be made in the rehabilitation of these unfortunate undertakings.

Fifteen Administrations

The Chinese Government Railways are divided into fifteen separate administrations, these comprising :—the Peiping-Hankow Railway, Peiping-Mukden Railway, Tientsin-Pukow Railway, Shanghai-Nanking and Shanghai-Hangchow-Ningpo Railway, Kiao-Tsi Railway, Peiping-Suiyuan Railway, Lunghai Railway, Canton-Hankow Railway, Hunan-Hupeh Railway, Chengtai Railway, Canton-Kowloon Railway, Nanchang-Kiukiang Railway and Taokow-Chinghua Railway.

Originally, some 1,598 miles of these railways were virtually under British management, the right of appointment of the principal officers of certain lines being vested in the representatives of the British capital involved, in accordance with the terms of the various loan agreements. In recent years, however, the bulk of these appointments have lapsed into Chinese hands, though certain important posts are still retained by nominees of the British interests concerned. At the present time, British financial interests in the Chinese Government Railways are represented by the British and Chinese Corporation, Limited, of 3 Lombard Street, E.C.3 (Shanghai-Nanking, Shanghai-Hangchow-Ningpo, Canton-Kowloon and Peiping-Mukden Railways), and the Pekin Syndicate, Limited, managers and administrators of the Taokow-Chinghua Railway. In Manchuria, there is the Chinese Eastern Railway (the Russian administrative personnel of which was ousted by the Chinese), the Kirin-Changchun Railway, the headquarters of which are at Changchun, and the South Manchuria Railway, the Japanese-owned system which was the cause of much of the friction leading to the present troubles between China and Japan. Actually, China possesses some 8,750 miles of railways, a mileage which is vastly lacking in proportion to the area and population of the country.

Shanghai-Nanking Railway

The Shanghai-Nanking Railway, which has a mileage of approximately 260, of 4-ft. 8½-in. gauge, suffered very badly during the civil wars, and has now sustained further damage owing to bombardment by Japanese warships (the North Station, an exceptionally fine building, was demolished). The preliminary arrangements for the construction of this system were made between the Chinese Government and the British and Chinese Corporation, Limited, in 1898, but, owing to various difficulties, work was not commenced until 1904. In addition to Shanghai and Nanking, the principal stations are Suchow, Wusih, Changchow and Woosung.

Peiping-Mukden Railway

The Peiping-Mukden Railway (formerly known as the Pekin-Mukden Railway) has some 683 miles of line open and about 156 miles under construction. It is of 4-ft. 8½-in. gauge, and was completed in 1896, being built with Chinese capital which was later supplemented by a British loan. The system consists of a main line from Peiping (Pekin) to Mukden, where the South Manchuria Railway is joined, and branch lines to Chungchow, Hsiku, Chinwangtao and Yingkow.

The Peiping-Hankow Railway, with a mileage of 700, was completed in 1905 by a Belgian syndicate largely financed with French capital, the line being taken over by the Chinese Government in 1907. The principal points served are Paoting, Chonentafu, Chenting, Chengchow, Sutchon, Suiyang, Yentching and Choumatien. The Peiping-Suiyuan Railway is 550 miles in length, and was constructed out of funds provided by the profits made by the Government railway between Peiping and Hsinminting. Originally, the line ran from Peiping to Hankow Pass, but in 1909 it was extended to Kalgan and, later, to Paoton.

Tientsin-Pukow Railway

The Tientsin-Pukow Railway, which is some 690 miles in length, connects Peiping with Pukow, on the Yangtze River, opposite Nanking. It is one of the most important trunk lines in China, and capital for its construction was raised by means of British and German loans, the section between the Grand Canal and Pukow (236½ miles) being built by British capital and British engineers. Owing to various delays, it was not until 1912 that through running on the line was possible. Connection with the Shanghai-Nanking Railway is made by means of a ferry service across the River Yangtze, between Nanking and Pukow, whilst the line joins the Peiping-Mukden Railway at Tientsin.

Canton-Kowloon Railway

It was in 1898 that the British and Chinese Corporation, Limited, obtained the concession to build a railway between Canton and Kowloon, a distance of 89¼ miles, and the line was opened for traffic in October, 1911. The line was financed by a British loan, repayment and interest being guaranteed by the Chinese Government. The whole of the line is single track, but there are 12½ miles of sidings and loops.

The Taokow-Chinghua Railway, which is about 95 miles in length, was built by S. Pearson and Son, Limited, for the Pekin Syndicate, Limited, the line between Taokow and Pashan (90½ miles) being opened for traffic in 1905. The same year the railway was taken over by the Chinese Government and extended to Chinghua.

Manchurian Lines

The South Manchuria Railway, which was acquired by the Japanese Government under the terms of the Peace Treaty between Japan and Russia in 1905, comprises some 691 miles, of which 438½ miles represent the main line from Dairen to Changchun. The Mukden-Antung line is 162 miles long, the Port Arthur line 32 miles long, and the Fushun line 33 miles long. The doubling of the line between Dairen and Changchun was completed in 1915. The whole of the area covered by the company's operations is divided into two divisions, with offices respectively at Mukden and Dairen: and the many and varied operations are classified under five departments, each having a chief who acts as general manager of the department, and comes directly under the board of directors. The five departments are those pertaining to (1) railways, (2) local affairs, (3) industries (including the upkeep of museums, agricultural, geological, etc.), (4) treasury, and (5) general affairs.

Political Aspect

As to the political aspect of the South Manchuria Railway in Japanese hands, it may be said that, previous to this epoch, Manchuria was in large measure a closed area, a forbidden land; such produce as went outside its own frontiers, or beyond the district in which it was produced, was taken by primitive Manchurian cart or the natural waterways; and there was practically no immigration. Since the fertility of the country has been increased and its productivity, especially along the railway zone, has become known, a continuous stream of immigration from other parts of China has been set up, and the population of Manchuria is rapidly increasing. Along the railway zone, in 1907, the Chinese population numbered only 8,902, whilst latterly it was over 900,000 out of a total population of over 1,100,000—82 per cent of the whole—and an ever-increasing stream of immigrants was, until recently, continuing to move northwards along the railway lines from the disturbed and famine-stricken regions of China. Actually, the produce of this area is transported mainly, although from Chinese soil, by Russian or Japanese Railway to the port, and China is, or has been, constructing competing railways and a new port (Hulutao), so as to secure some of this transportation for her own nationals. Hence the recent troubles in Manchuria.

Chinese Eastern Railway

The Chinese Eastern Railway, one of the earliest to be built in China, is of 5-ft. gauge, its headquarters being at Harbin, Manchuria. The agreement for its construction and operation was signed by the Chinese Government and Russo-Chinese Bank in 1896, and, whilst the preliminary work was in hand, Russia seized Port Arthur and obtained a lease of the Liaotung Peninsula with the right to build a railway to join the previously authorized line at Harbin. The main line connects the Trans-Siberian Railway with Vladivostock, the distance covered being 950 miles, whilst the southern section from Harbin to Port Arthur has a mileage of 650. Some 437 miles of the southern section were handed over to Japan at the conclusion of the Russo-Japanese war in 1905, hence only the portion between Harbin and Changchun now forms part of the Chinese Eastern Railway.

Hope of Rehabilitation

The terrible chaos wrought by the civil wars, coupled with the new threats of warlike action between China and Japan, give little immediate hope for the rehabilitation of the railways of China. Nevertheless, those who know China best are hopeful that a return to peaceful conditions will witness the rise of the railways once again. In the future, however, two great railway needs must be met. First, there is the completion of the Canton-Hankow line. Some of this railway is constructed already—a section at each end, from Canton northwards, and from Hankow southwards towards Canton—but there is a big gap of some 300 miles between these two sections. The completion of this missing link will have an enormous effect in the relationship between North and South China, through the development of new traffic; but, like all progressive and essential developments, it has met with much opposition, though no one doubts the immense stimulus that it will give to travel and traffic. Secondly, the great and wealthy province of Szechuen, with a population of 65,000,000 has not a mile of railway to-day; its port, Chungking, is some two or three weeks from Nanking or Peiping, and this province in the west must be more directly connected with down-river towns and with the world at large.

London Purchasing Commission

A development of particular interest as affecting British relationship with the Chinese railways was the setting-up of the London Purchasing Commission, in April of last year. This body whose business it is to arrange for the expenditure of £4,000,000 which has been allotted from the Boxer Indemnity Fund for the use of Chinese railways, is under the chairmanship of the Chinese Minister in London, and consists of two Chinese and four British members:—Dr. Sao Sze, Chinese Minister in London; Sir Arthur Balfour, vice-president of the International Chamber of Commerce; Sir Basil Blackett, chairman of Imperial and International Communications, Limited; Mr. W. T. Charter; Dr. C. C. Wang, formerly managing-director of the Chinese Eastern Railway; and Sir Ralph Wedgwood, chief general manager of the London and North Eastern Railway. A similar body in China, known as the Board of Trustees, which has to deal with the disposition of Boxer Funds in China, consists of Mr. Calder Marshall, chairman of the British Chamber of Commerce, Shanghai; Mr. Kenneth Cantlie; Mr. N. S. Brown, manager of Butterfield and Swire, Shanghai; Sir W. W. Hornell, vice-chancellor of Hongkong University; Mr. W. H. Donald, adviser to General Chang Hsueh-liang. The Chinese members of this board, of whom there are ten included, when it was originally set up, Chu Chia-hua, chancellor of the Central University of Nanking, who was to act as chairman of the board; and L. T. Soong, brother to T. V. Soong, the Minister of Finance. The board, which is under the Executive Council of the National Government, was appointed for a term of three years. Its head office is at Nanking. Many orders for British railway material have already been placed by this means.

The Steel Industry of Japan

A SURVEY

By HAROLD HUGGINS

(Continued from February Number)

In the manufacture of plates and sheets Japan's production has advanced so rapidly that in 1929 production was almost twice what it was in 1926. 1930 production of all classes of sheets was 567,529 kilo tons: 1929 production was 542,925 kilo tons, while production in 1928 was 429,629 kilo tons. In those three years imports fell from 342,937 kilo tons in 1928 to 151,187 kilo tons in 1930. The greatest decline is in the import of light sheets under 0.7 m.m. in thickness. These fell from 183,468 kilo tons in 1928 to only 27,446 kilo tons in 1930. There was very little change in imports of plates, but the tendency is to cut out the imports of everything that can be manufactured, in any way, at home.

Japan still lags behind in the production of tin plate. The Yawata Steel Works is the only maker. Imports though somewhat less in 1930 than in 1929, were only slightly under those in 1928. Total supply of tin plate has been:

1930	91,342 kilo tons
1929	99,443 ,, ,,
1930	88,503 ,, ,,

And of this total imports formed:

1930	68,912 kilo tons
1929	81,564 ,, ,,
1928	72,113 ,, ,,

There are to-day eight Japanese manufacturers of steel plates and sheets: These are:

1. Yawata Steel Works
2. Kawasaki Zosenjo K.K. Fukiai Mill.
3. Asano Zosenjo K.K. Steel Department.
4. Tokuyama Teppan K.K.
5. Tokai Kogyo K.K.
6. Kyushu Seiko Jo K.K.
7. Nakayama Usu Teppan K.K.
8. Nohon Kogyo K.K.

The total rated capacities of these companies, except the Kyushu Seiko Jo, and the Nakayama Usu Teppan K.K., are given below:

	Kilo Tons			
Company	*Heavy*	*Medium*	*Light*	
Yawata Steel	230,000	70,000	45,000	
Kwasaki Zosenjo	120,000	—	200,000	
Asano Zosenjo	60,000	—	—	
Tokuyama Teppan	—	—	36,000	
Tokai Kogyo	20,000	15,000	—	
Nihon Kogyo	—	—	7,000	
Total	430,000	85,000	288,000	
Kenjiho: Mitsubishi Seitetsu...	80,000	—	—	
Grand Total	510,000	85,000	288,000	883,000

(Does not include Kyushu Seiko and Nakayama Usu Teppan. Estimate these two at about 30,000 tons):

Sheet Mill Equipment

Company and Mill	*Type*	*Stands*	*Rollers Diameter m.m.*	*Length m.m.*	*r.p.m.*	*Maker*
Yawata Steel Works:						
No. 1 Plate Mill	3 rolls	1				
	Top and Bottom		864	2,794	87	Morgan
	Middle		508	2,794	87	,,
No. 2 Plate Mill	Rough:					
	2 rolls	1	1,245	4,572	64	Morgan
	Finishing					
	2 rolls	1	1,118	3,684	64	Mester
No. 3 Plate Mill	3 rolls	1				
	Top and Bottom		762	2,134	80	Morgan
	Middle		456	2,134	80	,,
No. 1 Medium Size Plate Mill	2 rolls					
	Rough	1	760	1,800	75	Yawata
	Finishing	1	750	1,800	75	,,
No. 2 Medium Size Plate Mill:	3 rolls	1				
	Top and Bottom		650	2,000	122	Yawata
	Middle		510	2,000	122	,,
Plate Steel Mill:	3 rolls	1				
	Top and Bottom		600	1,800	104	Krupp
	Middle		480	1,800	104	,,
	Rigid roll		460	1,800	104	,,
No. 1 Sheet Mill:	2 rolls					
	Pullover Type					
	Rough	1	710	1,170	35	
	Finishing	1	710	1,170	35	
	Cold Roll	1	710	1,170	35	
No. 2 Sheet Mill:	2 rolls					
	Pullover Type					
	Rough	4	760	1,170	34	(German)
	Finishing	4	760	1,170	34	,,
	Cold Roll	6	760	1,170	45	(Sumitomo)
Tin Plate Mill:	2 rolls					
	Pullover Type					
	Hot Roll	5	660	730	40	Osaka Sumitomo
	Hot Roll	1	710	865	40	Gruson
	Cold Roll	11	660	850	50	National Roll Co.
Kawasaki Zosenjo K.K. Fukiai Plate Mill:	3 rolls	1				
	Top and Bottom		864	2,794	90	Kawasaki
	Middle		508	2,794	90	,,
Fukiai Sheet Mill:	2 rolls					
	Pullover type					
	Rough	14	760	1,117	30	
	Finishing	25	760	1,117	30	
	Cold Roll	13	660	1,117	45	
Asano Zosenjo K.K. Yokohama Plate Mill	3 rolls	1				
	Top and Bottom		864	2,794	70	Nihon Seikojo
	Middle		508	2,794	70	Kubota
Mitsubishi Seitetsu K.K. Kenjiho Plate Mill	3 rolls	1				
	Top and Bottom		864	2,794		Mitsubishi Zosenjo
	Middle		508	2,794		,,
Tokai Kogyo K.K. Sheet Mill	3 rolls	1				
	Top and Bottom		680	1,800	80	Yukibukuro Kosakjo
	Middle		480	1,800	80	,,
Tokuyama Teppan K.K. Sheet Mill	2 rolls					
	Pullover type					
	Rough	3	710	1,117	30	Sumitomo
	Finishing	5	710	1,117	30	,,
	Cold Roll	2	660	1,117	30	Wm. Todd
Osaka Nakayama Teppan K.K. Sheet Mill	2 rolls					
	Pullover type					
	Rough	1	760	1,117		Sumitomo
	Finishing	1	760	1,117		,,
	Cold Roll	1	760	1,117		,,
Nihon Kogyo K.K. Yatsuya Sheet Mill	2 rolls					
	Pullover Type					
	Rough	1	710	1,170	35	Sumitomo
	Finishing	1	710	1,170	35	,,
	Cold Roll	1	710	1,170	35	,,

YAWATA STEEL WORKS.—Production of plates at the Yawata Steel Works for the last three years has been as follows :

Material	*1930*	*1929*	*1928*
Sheets over 0.7 m.m. in thickness ...	155,319	165,762	148,162
Same, under 0.7 m.m. in thickness ...	28,605	27,934	25,997
Silicon Sheets	5,348	3,287	3,376
Checquered Sheets	3,751	4,358	2,497
Tin Plate	22,430	17,879	16,390
Universal Plates	2,916	784	1,887
Total	218,369	220,004	198,309

Production in the private mills was confined to sheets over and under 0.7 m.m. in thickness :

Sheets over 0.7 m.m. in thickness ...	162,275	177,752	156,159
Sheets under 0.7 m.m. in thickness ...	186,885	145,169	75,161
Total	349,160	322,921	231,320

The Yawata Production is surpassed by the private production, and this is the case in only two other items, bars, and angles.

SILICON SHEETS.—Only Yawata Steel Works makes these. Production in 1930 was 5,348 kilo tons, as follows :

35 m.m.	4,015 kilo tons
43 ,, ...	1,333 ,, ,,
Total	5,348

CHECQUERED SHEETS.—Yawata's production of checquered sheets in 1930 was 3,745 kilo tons. The principal sizes were:

4.5 m.m.	1,364 kilo tons
6 ,, ...	1,869 ,, ,,

Besides these, there was a production of 494 kilo tons of untrimmed checquered sheets, and 80 tons of 4.5 m.m. flanged checquered sheets.

UNIVERSAL SHEETS.—There was a production of 2,905 kilo tons of universal sheets at Yawata Steel Works in 1930. The principal sizes were :

9 m.m.	710 kilo tons
11 ,, ...	456 ,, ,,
19 ,, ...	905 ,, ,,
25 ,, ...	264 ,, ,,

FLANGED SHEETS.—The Yawata Steel Works, produced 5,914 kilo tons of flanged sheets in 1930. The principal sizes were:

4.5 m.m.	1,841 kilo tons
6 ,, ...	2,075 ,, ,,

There was a production of 2,688 kilo tons of untrimmed plates in 1930. Principal size, 9 m.m.

There was also 529 kilo tons of defective plates produced in 1930. And of second-grade plates, 166 kilo tons.

KAWASAKI ZOSENJO K.K.—The Kawasaki Zosenjo K.K. (Kawasaki Dockyards Co., Ltd.) is an old company, with many financial difficulties. The Sheet Mill at Fukiai is perhaps to-day its most valuable property. The company has a capital of Y.90,000,000 of which Y.74,250,000 is paid in. Its reported losses since 1927 have been Y.53,000,000. It has debentures outstanding of Y.59,000,000, Loans of Y.25,600,000 and Bills Payable of Y.50,000,000, more or less. It has no important financial backing to-day, but there seems ot be a growing tendency for it to fall into Mitsui hands.

The Fukiai Sheet Mill is Japan's most important black sheet mill. Its rated capacity is 120,000 kilo tons a year of heavy plates, and 200,000 kilo tons of light weight sheets.

The mill was equipped in 1924, and production has been as follows :

	Kilo tons		*Kilo tons*
1924	39,574	1929	180,146
1925	37,092	1930 1st half ...	110,467
1926	40,836	1930 Heavy Plates	35,505
1927	77,435	Medium weight	4,200
1928	125,982	Sheets ...	70,762

ASANO ZOSENJO K.K.—This company rolls only plates. Production has been,

	Kilo tons		*Kilo tons*
1918	4,000	1925	20,584
1919	25,115	1926	32,329
1920	8,309	1927	42,924
1921	11,120	1928	52,616
1922	13,315	1929	64,379
1923	8,480	1930 1st half ...	33,230
1924	11,859		

The rated capacity is 60,000 kilo tons a year.

TOKUYAMA TEPPAN K.K.—The Tokayama Teppan K.K. (Tokuyama Iron Sheet Co., Ltd.) was established in February 1928, taking over the Tokuyama mill of the Osaka Teppan K.K. (now engaged in making galvanized sheets only). Its authorized capital is Y.5,000,000, of which Y.2,500,000 is paid in. Rated capacity is 36,000 kilo tons of black sheets. Production the first half of 1930 was only 4,057 kilo tons. The company is in financial difficulties, like most of the steel makers.

Production has been :

	Kilo tons		*Kilo tons*
1927	24,408	1929	31,110
1928	26,723	1930 1st half ...	4,057

TOKAI KOGYO K.K.—This company has a rated capacity of 20,000 kilo tons of heavy plates, and 15,000 kilo tons of medium weight plates : total 35,000 kilo tons.

Production has been :

	Kilo tons		*Kilo tons*
1918	3,195	1926	16,717
1919	5,203	1927	17,866
1920	5,186	1928	19,419
1921	2,294	1929	24,426
1922	7,537	1930 1st half ...	18,794
1923	9,702	1930 Heavy ...	7,630
1924	12,461	Medium ...	136
1925	14,106	Light ...	11,028

KYUSHU SEIKO K.K.—Capacity for rolling sheets is 60,000 kilo tons a year, but this is not official. Production only in 1929 is known, and that was 17,352 kilo tons.

NAKAYAMA USU TEPPAN KOJO.—This is a private concern, of which no financial details are given. Its rated capacity is not announced.

Production began in 1929, and was 10,020 kilo tons.

It produces black sheets only.

NIHON KOGYO K.K.—Established May 1919, capital Y.200,000, all paid in. This company's rated capacity is 7,000 tons of black sheets.

Production has been :

	Kilo tons		*Kilo tons*
1925	3,055	1928	6,580
1926	5,842	1929	7,917
1927	6,088	1930 1st half ...	1,565

MITSUBISHI SEITETSU K.K. KENJIHO MILL.—This company although rated at 80,000 tons a year of heavy plates, does not manufacture an ounce of steel to-day.

SALES ASSOCIATIONS FOR PLATES AND SHEETS.—There are four associations which regulate the sales and in some cases the production of plates and sheets in Japan :

1. Nihon Kuriota Usumono Kyohan Kumiai, Controlling sheets of 13 to the bundle.
2. Nihon Kurita Atsumono Kyohan Kumiai, Controlling sheets of 3 to 12 a bundle.
3. Chu-ita Kyohan Kumiai, Controlling sheets of 1.6 m.m. to 6 m.m.
4. Nihon Atsu-ita Kyohan Kumiai, Controlling sheets 6 m.m. and over.

GALVANIZED SHEETS.—The making of galvanized sheets is confined to small mills, which buy the black sheets from the big steel makers, or import them. There are no figures giving production, but the principal makers listed below have an annual capacity of about 120,000 kilo tons a month. There are many small makers, who operate when business is good and when it is bad shut down.

(Continued on page 122)

China's Capital City Now Served by Strowger Automatic Equipment

City of Nanking, Now Scene of Momentous Governmental Activities, Converts Three of Its Busiest Offices to Strowger Automatic Dial Operation. Initial Installation Totals 5,000 Lines of Equipment

**By HARRY S. JANES, Vice-President Automatic Electric Sales Company, Ltd.*

THE ancient city of Nanking, the capital of the Republic of China, is now served by the most modern telephone equipment, the three exchanges, Central, North and Hsiakwan, having been cut-over to Strowger Automatic operation some months ago. Two other exchanges, Pukow and Puchen, remain on manual operation for the present, but are soon to be connected to automatic working.

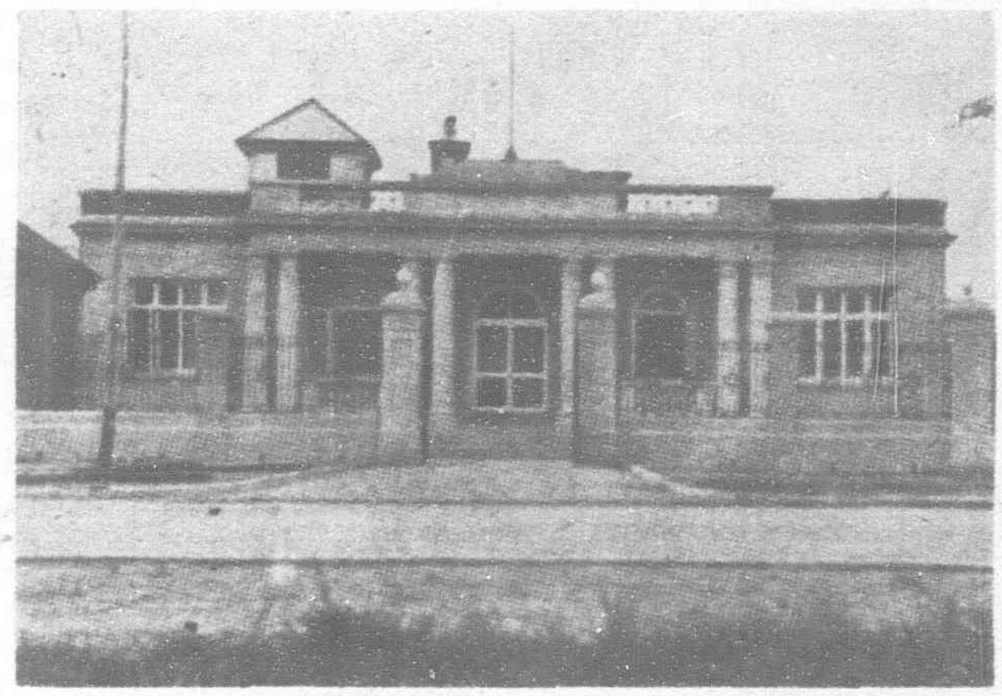
Nanking, one of the most important cities of China, has a population of some 400,000 and is situated on the Yangtze River about two hundred miles northwest of Shanghai. It has been a city of importance for many centuries, having been the capital of its province from 317 A.D. to 582 A.D., and capital of the Empire from 1368 to 1403. Now, as the capital of the Republic of China, it is again the scene of important governmental activities.

The city is now being rebuilt by the government along modern lines. Many fine government and privately owned buildings have already been erected and many more are planned for the future. It will, however, retain much of its ancient charm and its many points of historical interest, such as the famous city wall which is thirty-five miles in length and the longest city wall in China.

An excellent new highway has been constructed from the Yangtze River to the tomb of Sun Yat Sen, the much revered father of the Republic of China. This tomb, built almost entirelyof granite high up on the side of Purple Mountain, with its radiant blue tile roof visible for many miles, is an edifice of great beauty, and many pilgrimages will be made along the new highway to pay homage to Sun Yat Sen.

Nanking is the junction point of the railway to Tientsin, Peiping, Mukden and Harbin and the terminating point for much of the heavy river traffic from large manufacturing and milling centers between Shanghai and Nanking, such as Soochow, Wusih, Changchow and Chinkiang. Its military college, arsenal and factories for making war materials are also an important part of Nanking's varied activities.

It is quite fitting that a city of Nanking's importance, progressiveness and business activity should be served by the best in telephone equipment. Great credit for the program of modernizing the city's telephone system is due the following officials who were at that time in control of the city's communication affairs, namely Messrs. Z. S. Yu, manager of the Nanking Telephone Administration; T. C. Yih, chief engineer of the Nanking Telephone Administration; J. T. Chevang, director-general of the Board of Communications, and E. F. Wei, vice minister of the Board of Communications.



Substantial and handsome new building housing Strowger Automatic Equipment for North Office, Nanking

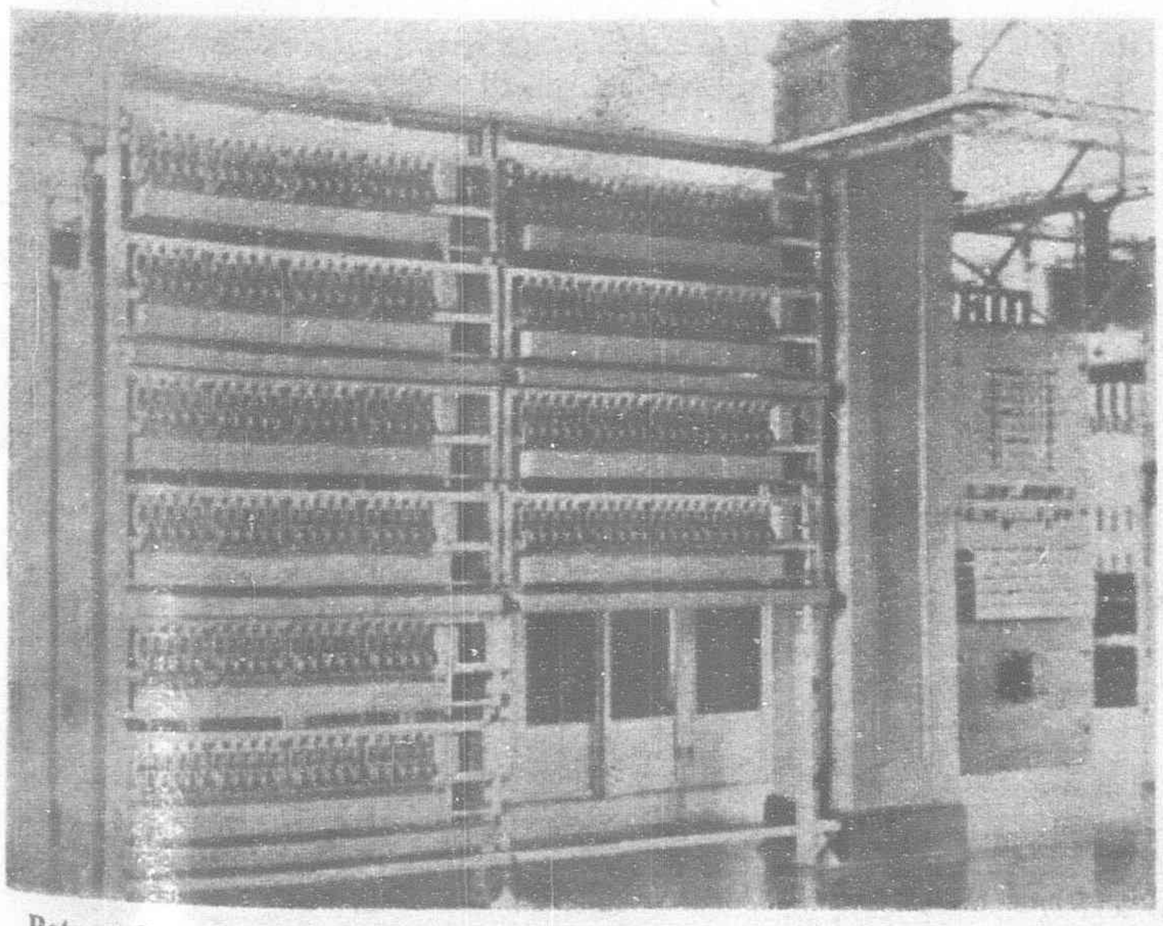
Strowger automatic telephone equipment has been installed for initial capacities as follows:

Central Exchange	..	3,000 lines
North Exchange	..	1,000 lines
Hsiakwan Exchange	..	1,000 lines

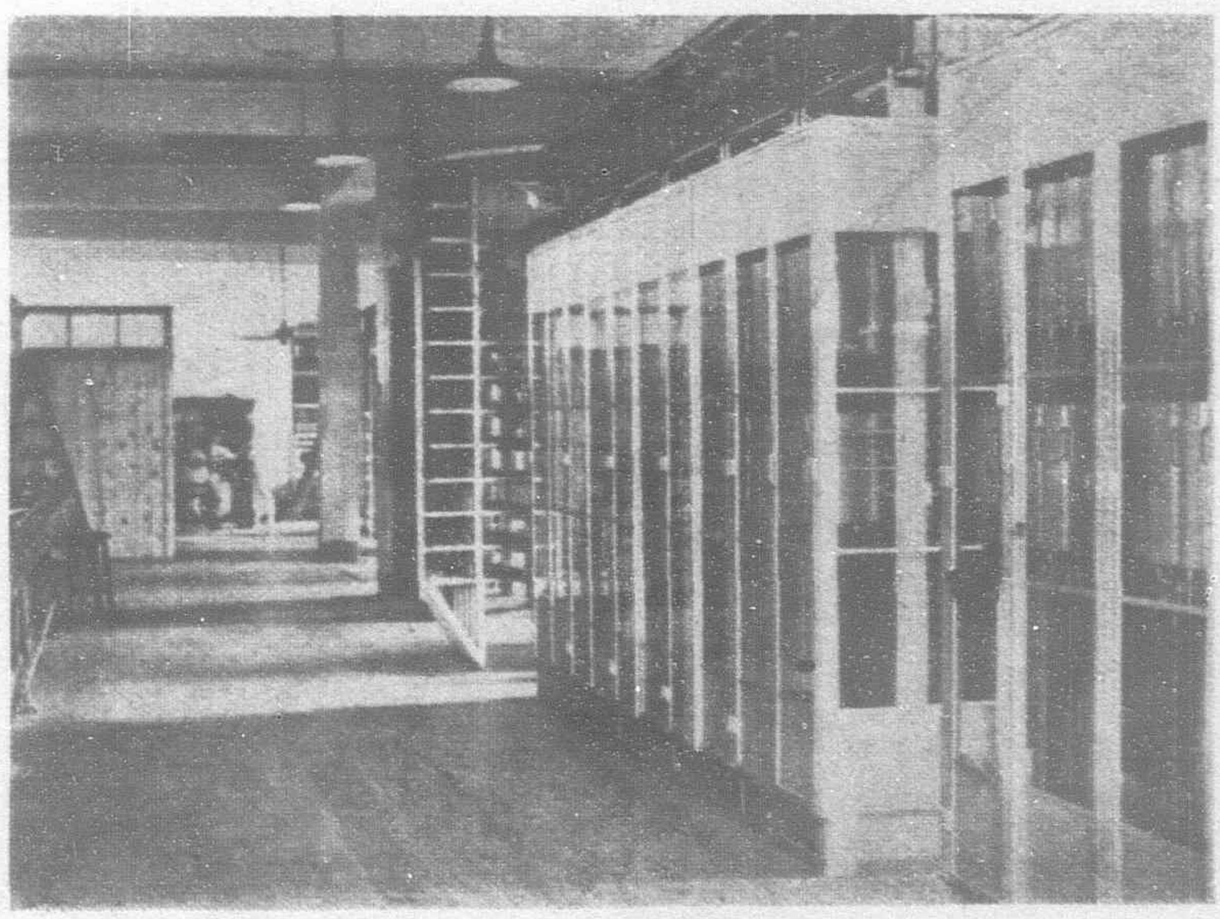
Central exchange serves the main business district which includes the governmental offices. Hsiakwan exchange is located just outside the city wall and serves the steamship companies and concerns having to do with the river shipping. North exchange is located about midway between Central and Hsiakwan exchanges. The government railway offices, some embassy buildings, consulate offices and residences are served by this exchange. The two manual exchanges, Pukow and Puchen, are located on the opposite side of the Yangtze River and are connected to Hsiakwan exchange by a submarine cable across the river which is over a mile wide at the point of crossing.

Self-aligning plunger type lineswitches are used, being mounted on units having a capacity of one hundred lineswitches on one side

*Reprinted from *Automatic Telephone*.



Rotary Secondary Lineswitches and Combined Distributing Fuse and Supervisory Panel at North Office



General view of Strowger Automatic Equipment at Central Office, Nanking

with the associated connector switches mounted on the opposite side. Each primary lineswitch unit of one hundred lines is equipped for peg count registration of all originating and terminating calls, thus providing for traffic studies. The secondary lineswitches are mounted on single sided racks having a capacity of six shelves of twenty lineswitches per shelf.

Local secondary lineswitches of the rotary type are installed between the primary lineswitches and local first selectors. Local first, second and third selectors, special service second and third selectors, inspector's ring back switches, and individual and trunk hunting connectors for P.B.X. service complete the local switch train. The selectors are mounted in double-sided distributing type terminal assembly trunk boards having a capacity of two hundred and forty selectors. This type of terminal assembly provides a very efficient method for arranging graded trunk multiples and also imparts ease of modification in the event of traffic variations.

For calls between the three automatic exchanges there are direct trunks with the necessary repeaters and incoming selectors in each exchange. Calls from the automatic exchanges to the manual exchange, Pukow, are trunked through Hsiakwan exchange, the "O" level of the second selectors in Hsiakwan being assigned to trunks to Pukow. Calls to the other manual exchange, Puchen, are handled through Pukow. Calls from Pukow and Puchen to the automatic exchanges are handled by the Pukow operator over trunks terminating on incoming first selectors in Hsiakwan exchange.

The local and inter-office trunking scheme for the three automatic exchanges follows standard practice with certain modifications. The numbering scheme is as follows:

Central Exchange:
P.B.X. Line Numbering:
21100 to 21199
Individual Line Numbering:
21000 to 21099
21200 to 21999
22000 to 22999
23000 to 23999
North Exchange:
P.B.X. Line Numbering:
31100 to 31199
Individual Line Numbering:
31000 to 31099
31200 to 31999
Hsiakwan Exchange:
P.B.X. Line Numbering:
41100 to 41199
Individual Line Numbering:
41000 to 41099
41200 to 41999
Special Service Numbering
(Central, North, Hsiakwan):
114 Wire Chief
117 Complaint
119 Inspector's Ring Back
20 Toll
29 Information

Toll Recording and Information are centralized in Central exchange, and all calls for these services are trunked over the regular inter-office trunks to the incoming second selectors in Central, the "0" and "9" levels of which are assigned to "Toll Recording" and "Information," respectively.

Toll connections between Nanking and Shanghai are made over three toll lines between these two cities. It will be noted that no special toll dialing switch train has been supplied, calls from the toll operator to subscribers being handled over the regular switch trains.

Test distributers and test connectors are installed for completing tests from the test desk and a test distributer selector has been placed in Central exchange, giving the information desk access to the test distributers in Central, North and Hsiakwan exchanges, thus permitting verification by the information operator of any number desired.

A three position test desk and a four position information, complaint and intercepting desk are installed in Central exchange. Hsiakwan has a two position test and complaint desk and North a one position test and complaint desk. All of these desks were supplied by Automatic Electric Sales Company, Ltd. This organization also supplied the automatic equipment, which was manufactured by Automatic Electric Company of Chicago, Illinois.

The Steel Industry of Japan

(Continued on page 120).

The principal makers of galvanized sheets are:

1. *Tokyo Aen Mekki K.K.* (Tokyo Galvanizing Co., Ltd.)
   Office: Suna Machi, Minami Katsushika Gun, Tokyo Prefecture.
   Established: July, 1918.
   Authorized Capital: Y.1,000,000: Paid-in Y.650,000.
2. *Osaka Teppan Seizo K.K.* (Osaka Iron Sheet Mfg. Co., Ltd.)
   Office: Sakurajima Machi, Konohana Ku, Osaka.
   Established: May, 1911.
   Authorized Capital: Y.1,500,000, all paid in.
3. *Taisho Teppan Mekki Goshi Kaisha.* (Taisho Iron Sheet Galvanizing Co., Limited Liability Partnership).
   Office: No. 2-7 chome, Kameido Machi, Minami Katsushika Gun, Tokyo Prefecture.
4. *Toho Aen Mekki K.K.* (Toho Galvanizing Co., Ltd.)
   Office: No. 322-8 chome, Oshima Machi, Minami Katsushika Gun, Tokyo Prefecture.
   Established: January 1927.
   Authorized Capital: Y.70,000.
5. *Kyoritsu Aen Mekki Kaisha.*
7. *Nakayama Aen Mekki Gomei Kaisha.* (Nakayama Galvanizing Co., Unlimited Liability Partnership).
   Office: 3496, Kita Saiwai Cho, Kanagawa Ku, Yokohama.
   Established: May, 1924.
8. *Showa Mekki Kaisha.*
9. *Toa Mekki Goshi Kaisha.*
   Toa Plating Co., Ltd.
   Office: No. 45-8 chome, Kameido Machi, Minami Katsushika Gun, Tokyo Prefecture.
   Established: January, 1920.
   Capital: Y.250,000.
10. *Azuma Mekki Kaisha.*
11. *Nakayama Aen Mekki Goshi Kaisha.* (Nakayama Galvanizing Co., Limited Liability Partnership).
    Office: Kamei Cho, Nihonbashi Ku, Tokyo.

These are the principal makers of galvanized sheets, and of them the Showa, Taisho Teppan, Toa, Azuma, are shut down.

IMPORTS OF GALVANIZED SHEETS.—These have practically ceased.

(To be continued).

Soviet Railway Transport

No important branch of national economy in the Soviet Union has been subjected to greater criticism during the past year than railway transportation. The Soviet press has been vigorous in its condemnation of practically every department of the railway service, which has failed to keep pace with the requirements of the great expansion in industry and new construction, the opening up of hitherto unexploited districts and the progress made in industrializing and mechanizing agriculture.

Nevertheless, railway transportation has made considerable progress in the past few years. In all important departments of railway work the pre-war level of operations has been surpassed. The total mileage has increased over 45 per cent (from 36,600 miles in 1913 to 53,100 miles in 1931); the volume of freight, which had dropped to only a fourth of 1913 in 1921, is now about two and a half times as great as the pre-war, while the passenger traffic in 1930 was nearly three times the pre-war figure.

New Construction

The construction of new railroads in the U.S.S.R. is proceeding rapidly. In 1928-29 the mileage of new lines laid was 1,600 kilometers (1,000 miles); in 1929-30 1,500 km. of new lines were built and 161 km. double-tracked. In 1931 the extent of mileage surpassed all preceding years, new lines totaling 3,168 km. (1,980 miles) and double tracks 3,432 km. (2,145 miles). The total length of railroad lines in 1913 was 58,500 km. (36,600 miles), whereas in 1931 the extent had increased to 85,000 km. (53,100 miles), a growth of over 45 per cent. In 1931 work was started on new lines with a total length of 10,000 km., on over half of which transport operations were inaugurated.

Expenditures for new construction in 1928-29 amounted to 156 million roubles, in 1929-30 this figure nearly doubled, 277 million being spent, while last year the figure was 425 million roubles ($219,000,000), an increase of about 53 per cent over 1929-30. The number of railway construction workers more than quadrupled during the past three years, totaling 239,000 last year as compared with 49,000 in 1927-28.

On October 1, 1931, only 57 per cent of the annual program of new construction had been accomplished and 73 per cent of the program for double-tracking. The most backward sections in the construction of double tracks were in Siberia. This deficiency is considered serious in view of the large industrial enterprises nearing completion and the necessity for greatly increased transport facilities. It is estimated that in 1937 the Ural-Kuznetz combine alone will provide a freight turnover in excess of the combined freight turnover of all Soviet railroads in 1931.

A. A. Andreyev, Commissar for Transportation

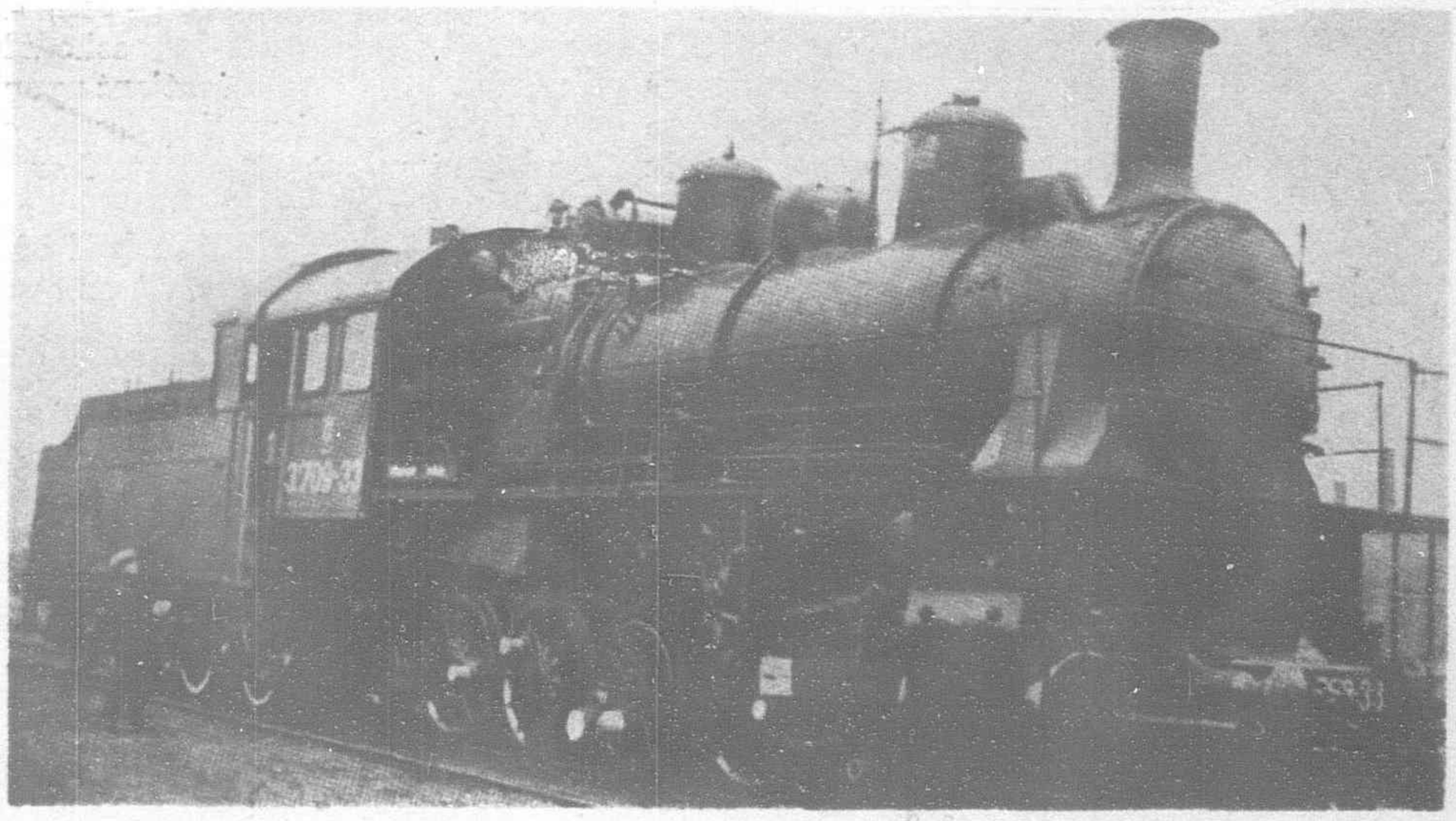
The inadequacy of the entire railroad network in the U.S.S.R. may be seen from a comparison with the United States, where there are 5.7 kilometers of railroads to every 100 square km. of area and 34.7 km. to every 10,000 inhabitants, while in the U.S.S.R. the railway mileage is 0.39 km. to every 100 sq. km., or about one-fourteenth as much as in the United States, and 5.2 km. to every 10,000 inhabitants, or about one-seventh as much.

Rolling Stock

In the fiscal year 1929-30 there was an average of 18,073 locomotives in operation, just about the pre-war average. It must be remembered that in 1921, when the reconstruction of the railroads was started, 62 per cent of the locomotive park was either being repaired or in need of repair. According to data for the year 1921-22 there were only 7,312 units in working order. The program for last year proposed an addition of 1,028 units, but from incomplete data it is apparent that only a small percentage was delivered at the end of the first nine months.

In view of the extreme urgency of increasing the number of locomotives available and of replacing the lighter type engines by those of the powerful American type, construction work on the Lugansk locomotive plant is being speeded up and scheduled for completion not later than October 1, 1932. The annual capacity is set at 1,080 units of the American type.

As in the case of locomotives, the supply of freight and passenger cars is not in accordance with the unprecedented growth in industrial output. The total number of freight cars in 1930 was 464,000. New construction for 1931 was to have totaled 60,000 units but was actually much less. The basic type prior to 1930 was the 16.5 ton truck, but the new cars are to have a capacity of from 20 to 50 tons and will be of the 8-wheel type. In October, 1931, the number of freight cars in operation was estimated at 480,000 with a capacity of 9 million tons; 85 per cent of these were of the 4-wheel type. In 1921-22 the number fit for service was estimated at 296,000 units. Thus the number of freight cars has almost doubled in the past ten years. Passenger cars were estimated at 20,000 in 1931, 18,210 third class and the balance first and second, as compared with a total of 12,969 in 1913.



Locomotive built at the Lugansk Works in the Ukraine

Freight and Passenger Traffic

By 1930 freight turnover had risen to 78 per cent above the pre-war level. In 1921 the volume of freight carried had fallen to only 25 per cent of that of 1913. By 1927-28 the 1913 level

had been exceeded, as shown in the following table :

	Freight Carried (in mill. tons)	*(in mill. ton-km)*		*Freight Carried (in mill. tons)*	*(in mill. ton-km)*
1913 ...	133.0	65.7	1930 ...	238.0	133.0
1927-28...	150.6	88.2	1933(Five.		
1928 29...	175.9	106.7	Year Plan)	28,.0	162.7

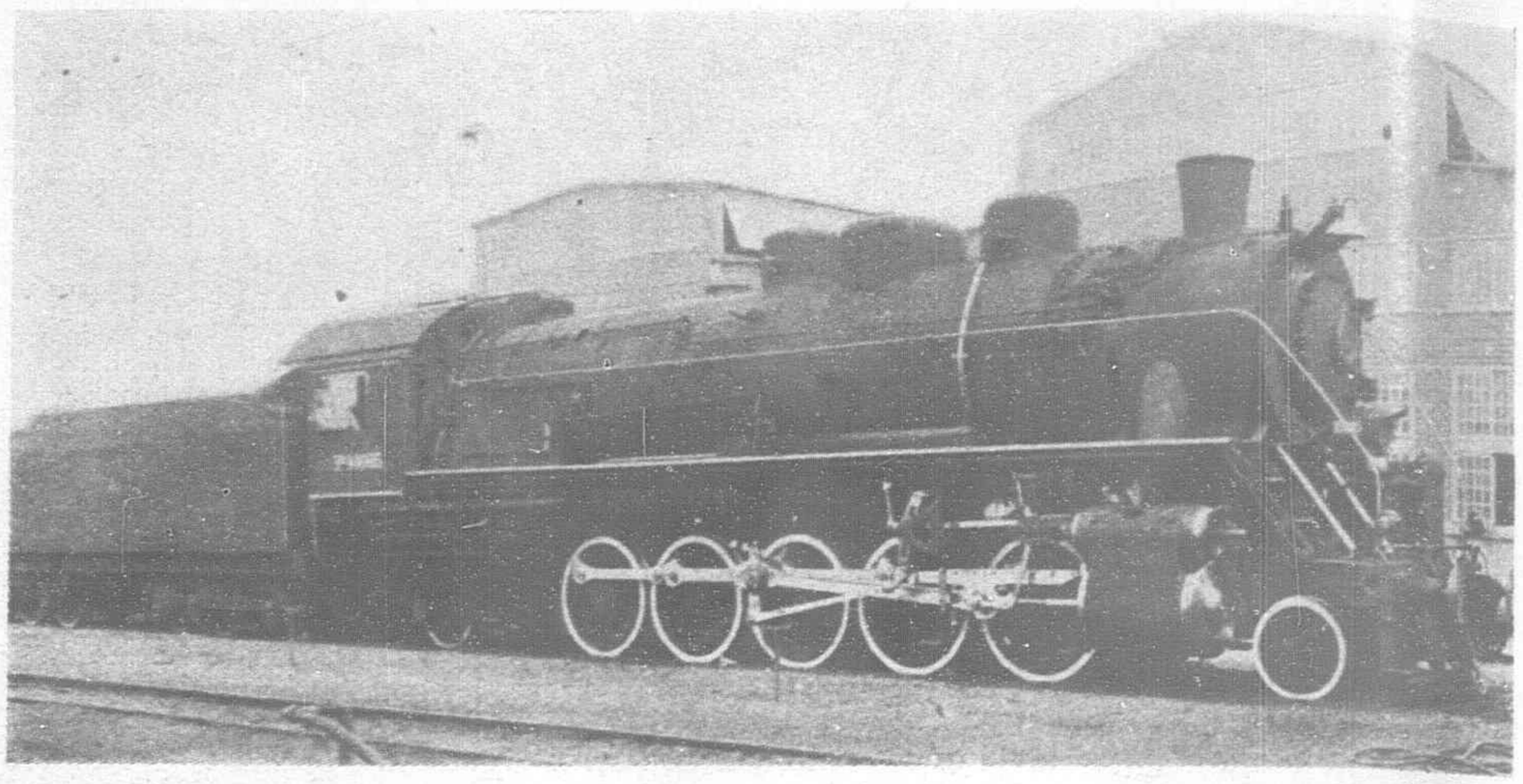
The estimates for 1931 called for a turnover of 340 million tons, or 20 per cent over the original Five-Year Plan schedules for the last year of the Plan. However, during the first quarter of 1931 freight turnover dropped 11 per cent below 1930, totaling 48,400,000 tons, with daily average loadings of 39,700 cars. Through the introduction of several new organizational measures, including the establishment of individual responsibility for the various railroad operations and the recalling of qualified railroad workers who had gone to work in other branches of industry, the results of the second quarter showed considerable improvement. Freight turnover reached 62,900,000 tons, and the daily car loadings averaged 51,500. The operations in the third quarter showed little improvement over the level of the preceding period, daily freight car loadings increasing only 1.5 per cent (52,300 instead of the scheduled 66,000 cars). In order to make good the shortcomings in railway operations upon which other vital branches of industry are dependent, a proclamation issued early in December, 1931, put the supply of railroad equipment before that of any other branch of industry.

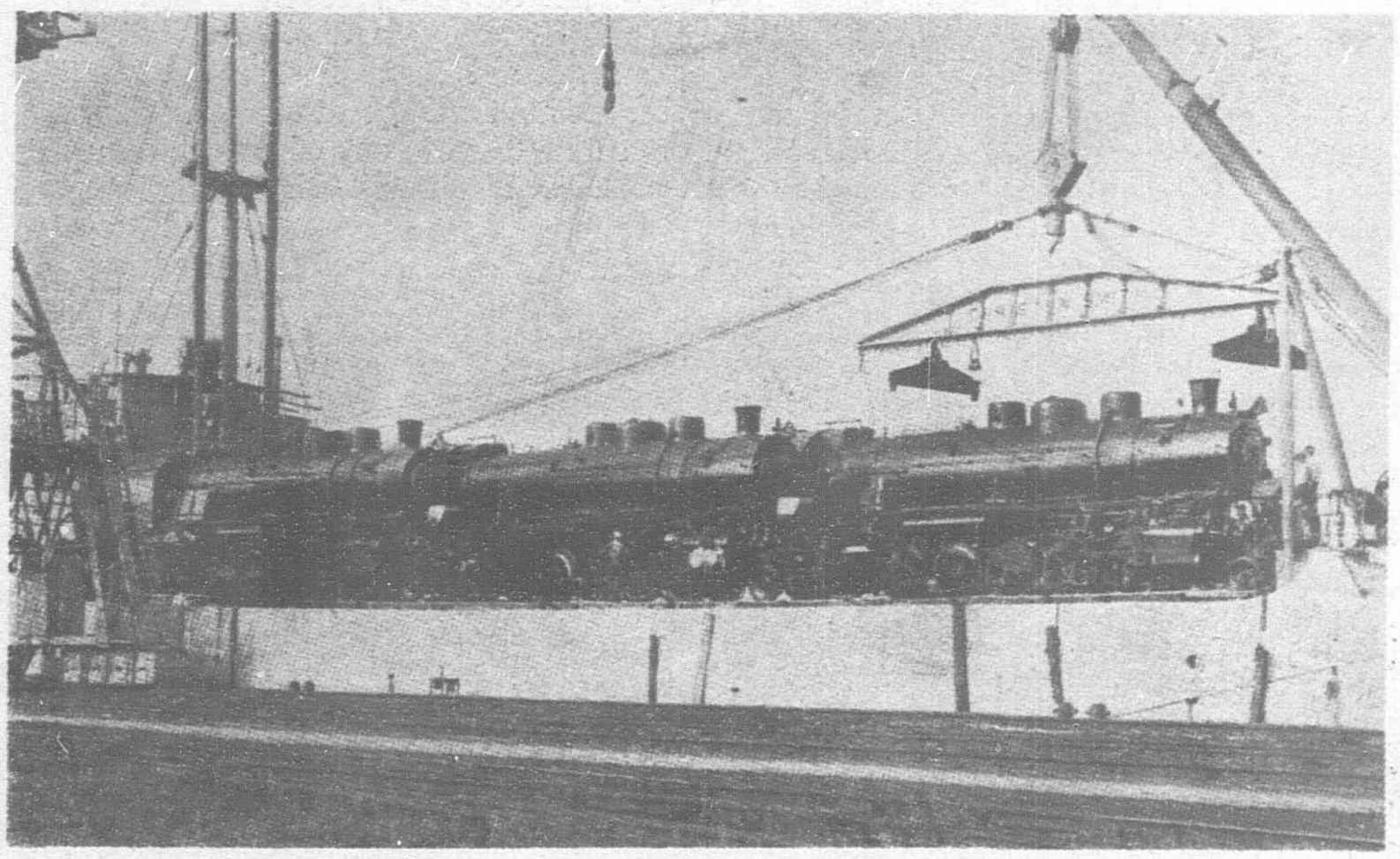
Before the war (1911-12) an average of 26,600 cars were loaded in 24 hours; in 1928-29 the average was 36,700, in the first half of 1931—45,300, and in the third quarter—an average of 52,300. However, as compared with the first nine months of 1930 freight loadings showed a decline of 1.2 per cent last year. This contrasts with the growth of industrial output, which increased about 20 per cent during the same period in 1931. Whereas the growth of the basic capital in industry has averaged about 14 per cent in the last few years, that in transportation has increased by only 3½ per cent annually.

In 1930 the turnover of passenger traffic was considerably over the original schedules for 1933, the number of passengers being over 510 million, or almost three times the 1913 level (185 million passengers), despite the fact that in 1921 the passenger turnover had dropped to 36 per cent that of 1913. The following table shows the growth in passenger transportation since 1927:

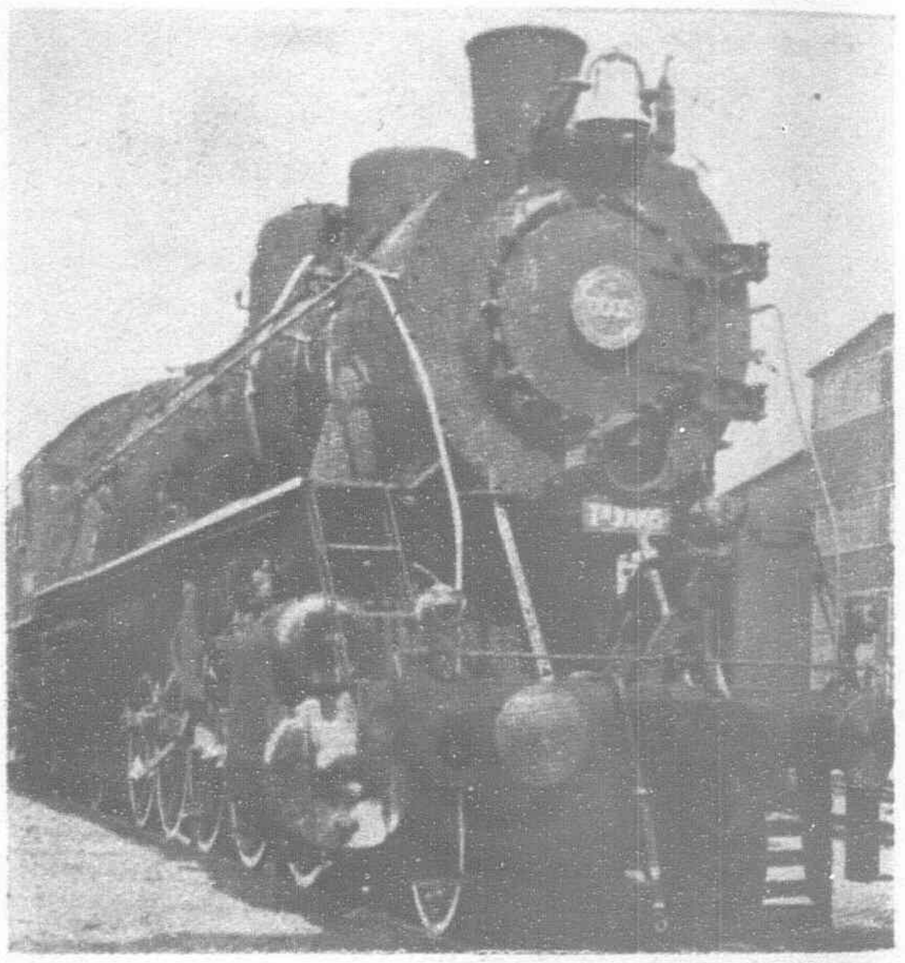
	Passenger Traffic (in millions)		*Passenger Traffic (in millions)*
1913	184.8	1929 30...	510.2
1927 28	280.8	1933 (Five-Year Plan) ..	455.0
1928-29	343.1		

(Continued on page 148.)





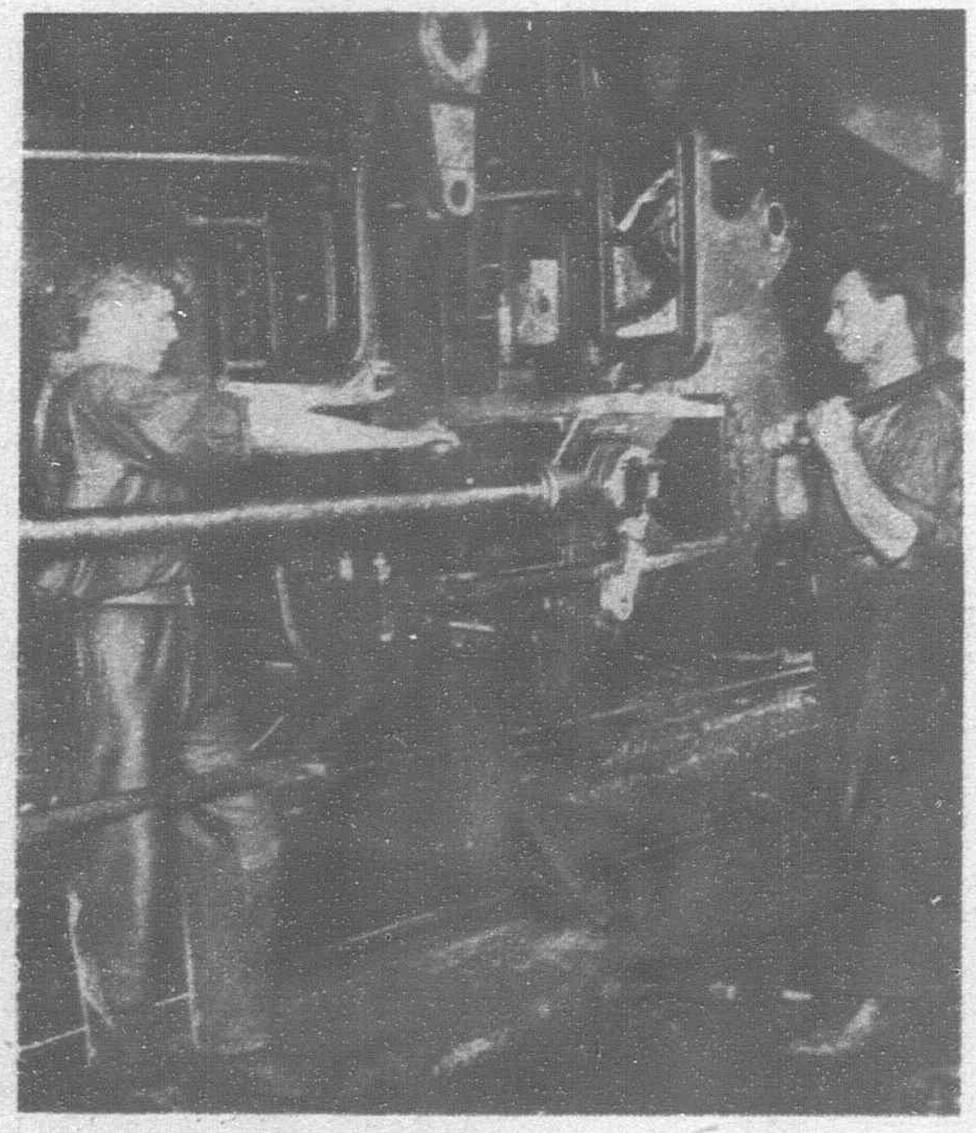
In August, 1931, the Baldwin Locomotive Works completed five 2-10-2 type locomotives for the railways of the Union of Soviet Republics. The Motor ship "Belmoira" on which these locomotives were shipped from Eddystone to Leningrad, also carried five 2-10-4 type locomotives built by the American Locomotive Company



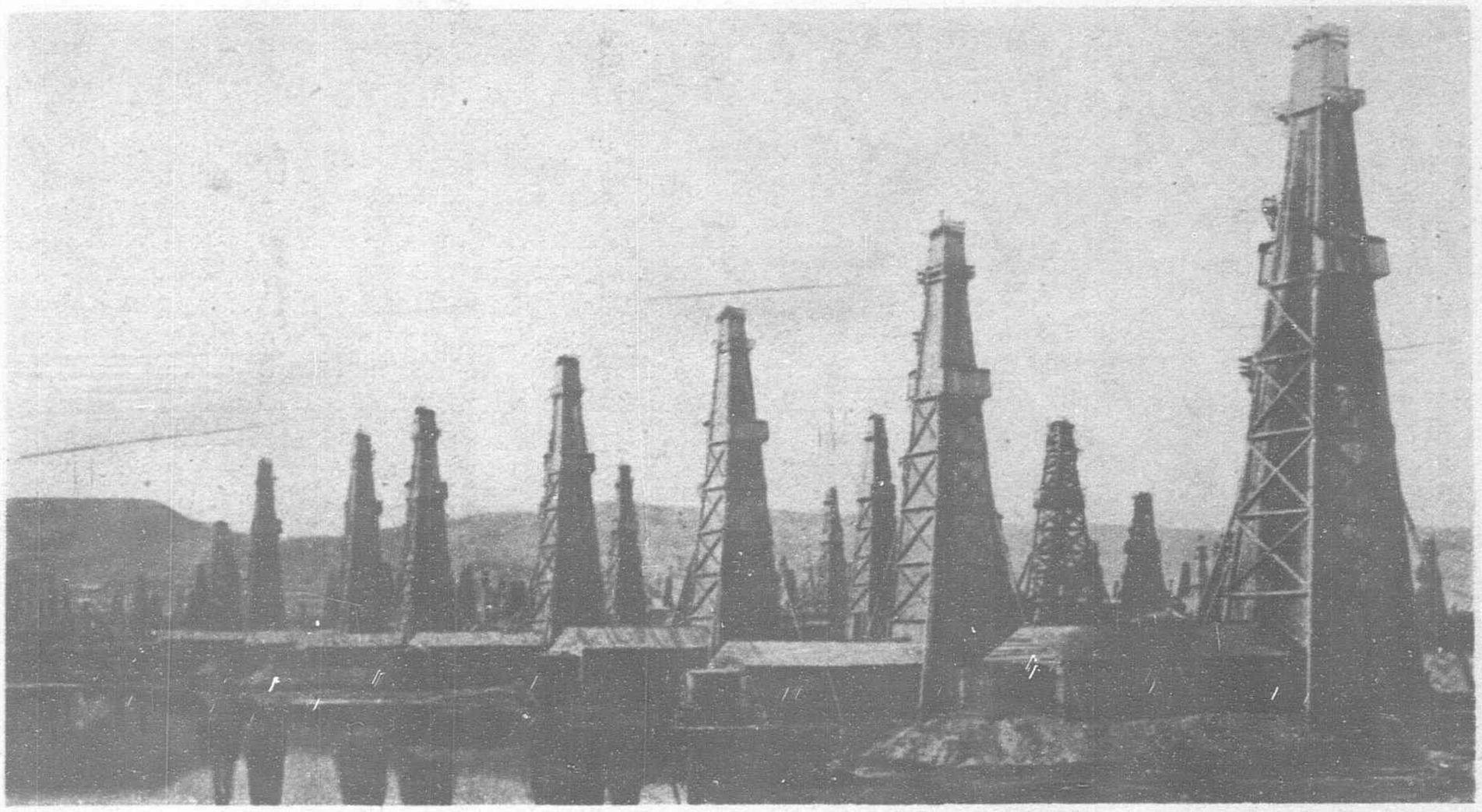
The upper picture and that on the lower right show Side and Front Views of one of the Baldwin 2-10-2 Type locomotives

Track gauge	1,524 m/m	Weight on drivers	150,000 kg.
Cylinders	700 m/m by 760 m/m	,, Total engine	152,000 kg.
Steam pressure ..	14 kg. per cm.²	,, Engine and tender ..	277,000 kg.
Drivers, diam... ..	1,520 m/m	,, Tractive force	25,000 kg.

Picture immediately above show three locomotives on a ship deck. Each boiler assembly was loaded separately and temporarily bolted to the chassis for shipment



Shock workers of the Moscow railway repair shop



New Oil Derricks in Llyich Bay, Near Baku, Azerbaidzhan

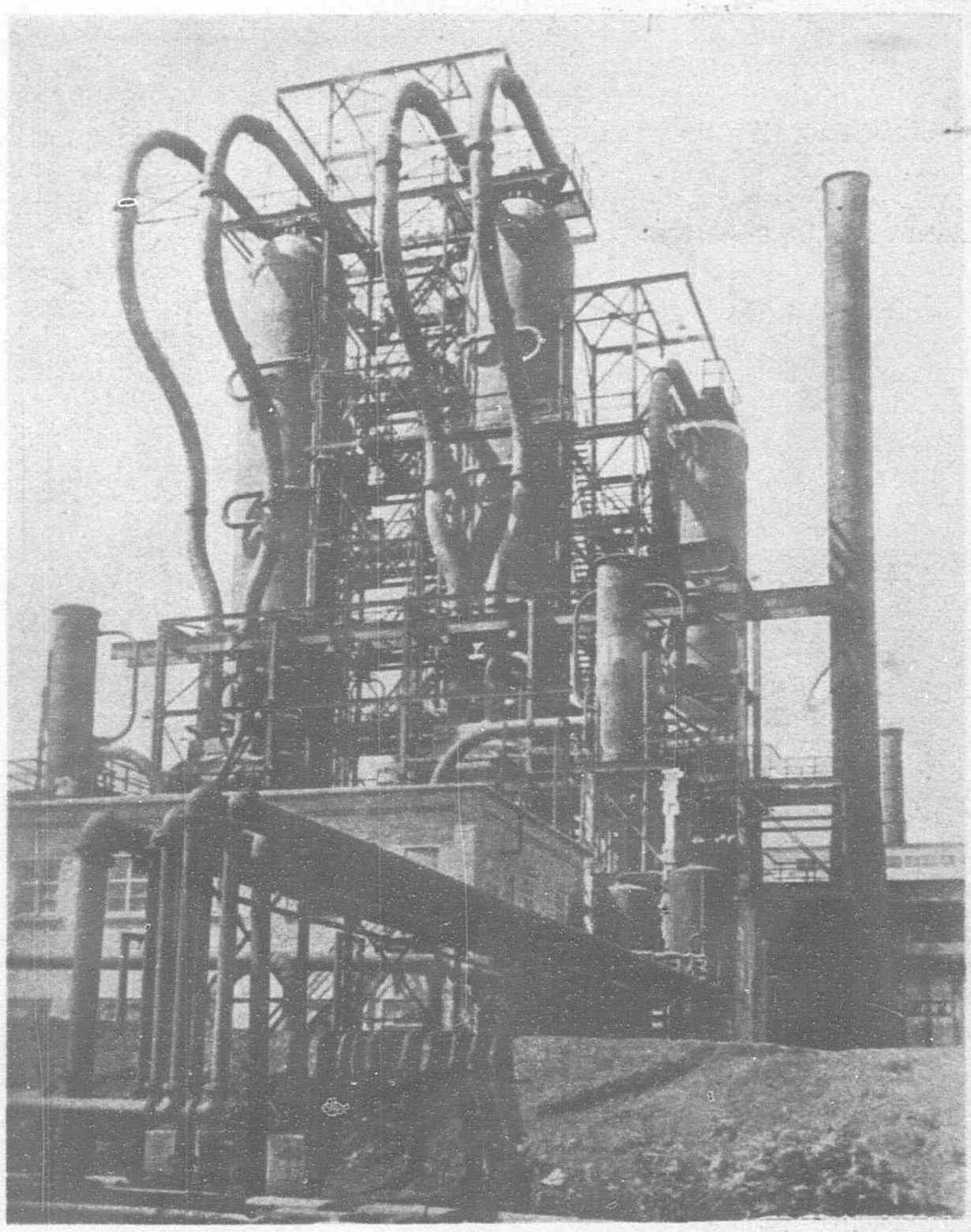
Soviet Oil Industry for 1932-1933

THE United Oil Industry (Soyuzneft) has in the main outlined the plan of development for the industry for the next two years. At present the amount of drilling to be done in each region and other details of the plan are being worked out. The program calls for the maximum exploitation of the old regions, particularly the Baku oil fields.

Output Planned

The total output for 1932 is set at 35,000,000 tons, not including natural gas. Last year production totaled 18,865,000 tons, while the plan for 1931 was set at 27,500,000. Of next year's total the share of the Azneft (Azerbaidzhan) Oil Trust is set at 20,000,000 tons, of the Grozneft (Grozny) Oil Trust at 10,600,000 tons, of the Maikop fields 2,600,000 tons, and 250,000 for the rest of the North Caucasus. The program of the Embaneft Oil Trust is 400,000 tons, for the Sredazneft (Central Asiatic) Oil Trust—400,000 tons, and for the Sakhalinneft Oil Trust—500,000 tons.

The 1933 program calls for an output of 46,000,000 tons distributed as follows: Azneft—24,000,000 tons, Grozneft—12,300,000 tons, Maikop—3,500,000 tons, other North Caucasian fields—1,800,000 tons (including 1,000,000 from Benol), Embaneft—1,800,000 tons, Sakhalinneft—1,200,000 tons, Sredazneft—800,000 tons, Gruzneft (Georgia)—300,000 tons, and Uralneft—200,000 tons. The output of gas for 1932 is set at 1,600,000 tons and for the following year at 2,400,000 tons.

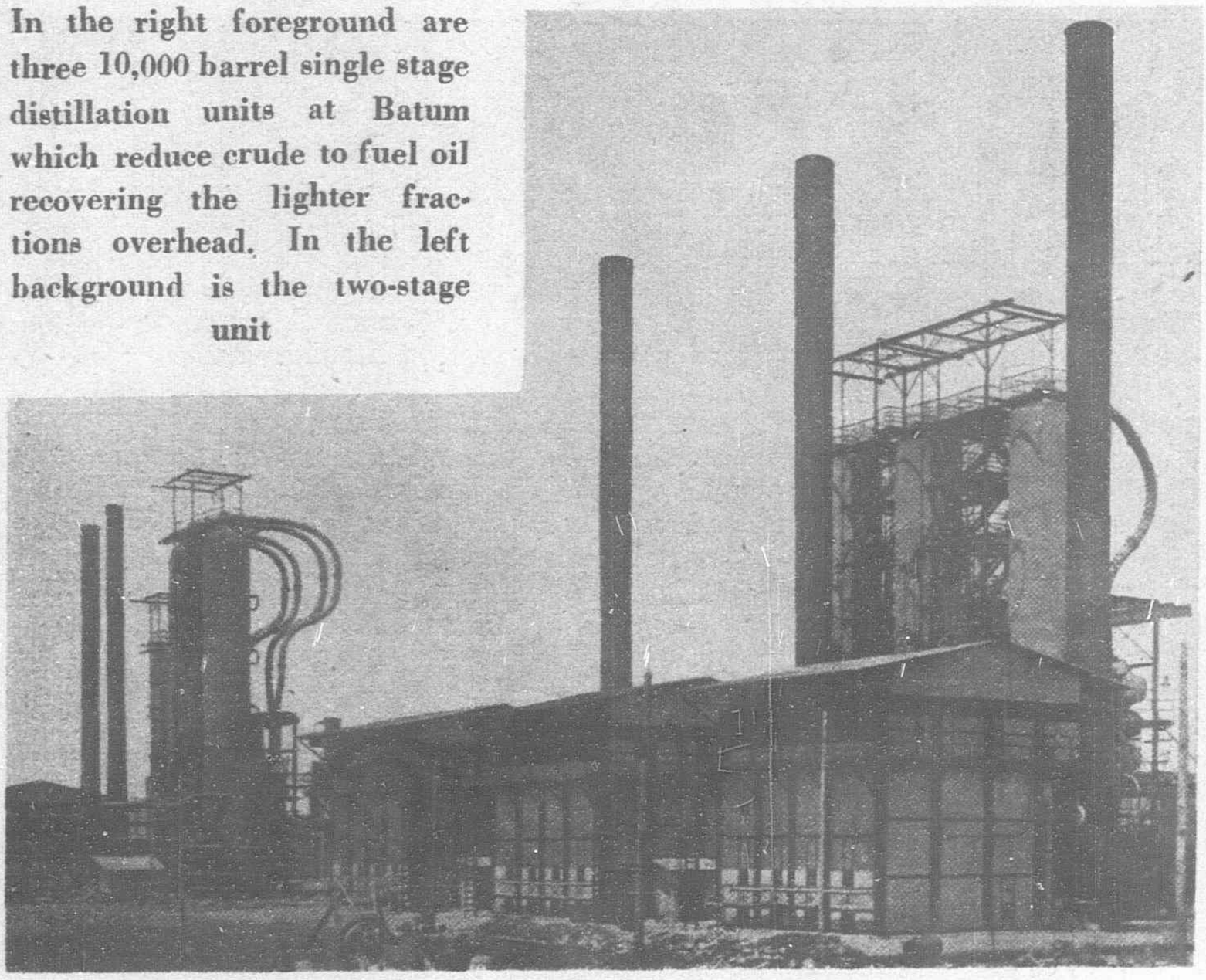


Foster Wheeler 10,000 barrel two-stage distillation unit at Batum, Russia. Crude oil is topped in the atmospheric tower at the right. The residue from the atmospheric tower is further heated and then flows through the two vacuum towers at the left, in parallel, and there lubricating stocks are recovered as overhead distillates

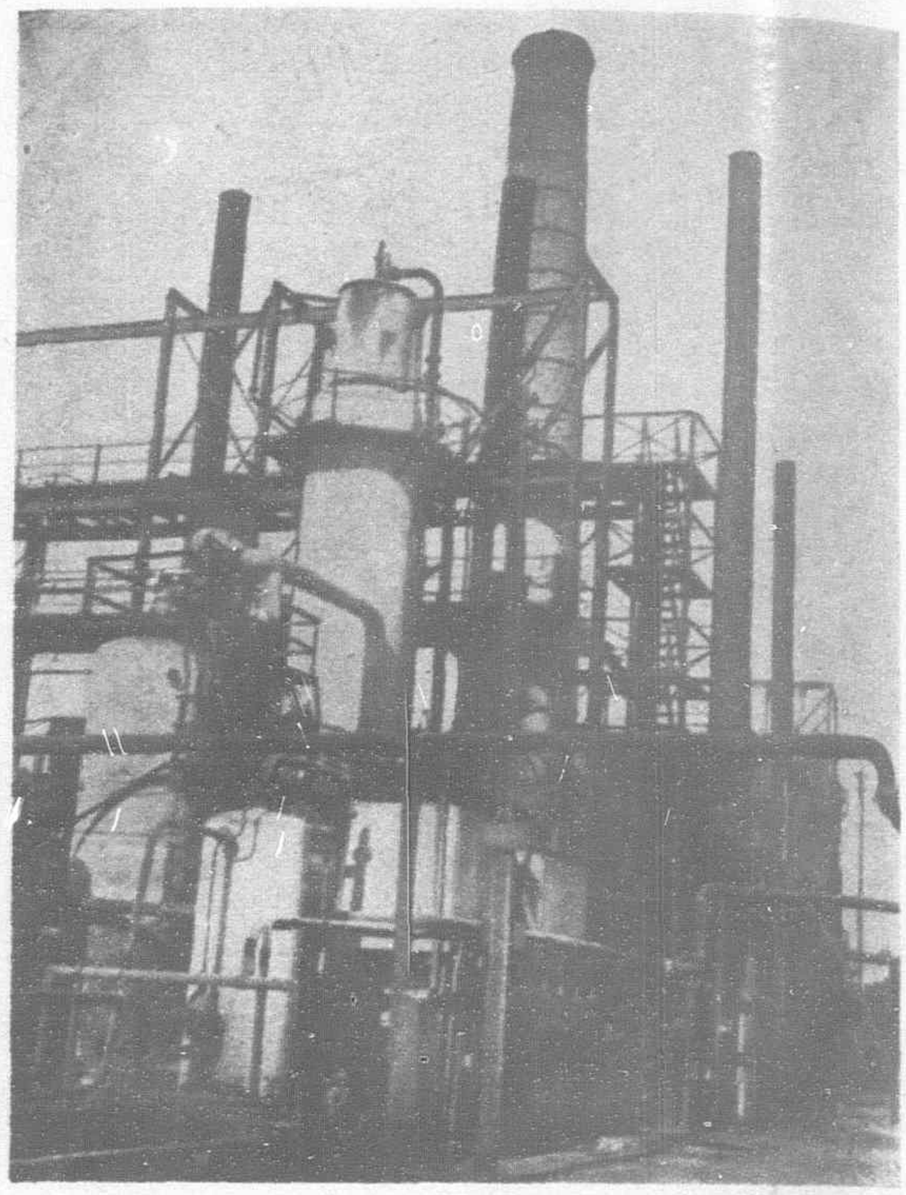
New Construction

The program foresees the construction of a number of new oil refineries, cracking plants for gasoline, etc. No new refineries for the working up of oil are planned for Baku, Grozny, Makhachkala, Batum, Tuapse, and Krasnodar, as plants now being built in these cities are expected to be completed. These include 30 additional cracking installations at Grozny. At the same time plants and cracking installations for the manufacture of lubricants, asphalt, etc., will be built at Moscow, Samara and Stalingrad to work up the crude oil shipped from Baku *via* the Volga River. A plant to refine the oil from the Maikop and Grozny fields will be completed in Armavir, in the North Caucasus, and will be enlarged gradually as production increases.

For the working up of the oil from Sakhalin two refineries will be built, one in Khabarovsk



In the right foreground are three 10,000 barrel single stage distillation units at Batum which reduce crude to fuel oil recovering the lighter fractions overhead. In the left background is the two-stage unit



The "Stalin" Gasoline Plant in Baku

and one in Vladivostok, with cracking installations at each city. A plant is also under construction in Kokand (Uzbekistan) for the working up of oil from the Central Asiatic fields, which will also be enlarged in accordance with the requirements of the oil output.

The 1933 construction program aims to provide for additional oil produced in 1934, and includes the building of refineries for oil products from Georgia, the Urals, and Kazakstan. The construction of plants in the last-mentioned localities is conditioned upon the results of explorations and drilling operations carried on in these regions this year and next year.

The entire plan for this year and for the next two years calls for the construction of new refineries of 25,000,000 tons capacity. The new cracking units to be installed number 105. The plan also includes the completion of the pipe line from Grozny to the Ukraine during 1932.

New Pipe Lines

The Grozny-Armavir section of the present Grozny-Tuapse pipe line will be used for refined oil products instead of crude oil. Another pipe line is planned from Armavir in the North Caucasus to Lisky in the Central Black Soil Region. The construction or this line, however, depends upon the results of prospecting operations in the Maikop field. Should it be built this line will later be extended to Moscow. A pipe line between the Temir oil field of the Embaneft and Aktubinsk (both in Kazakstan) is also planned for 1933. Altogether the plan calls for the laying of 2,800 kilometers (1,750 miles) in the next two years.

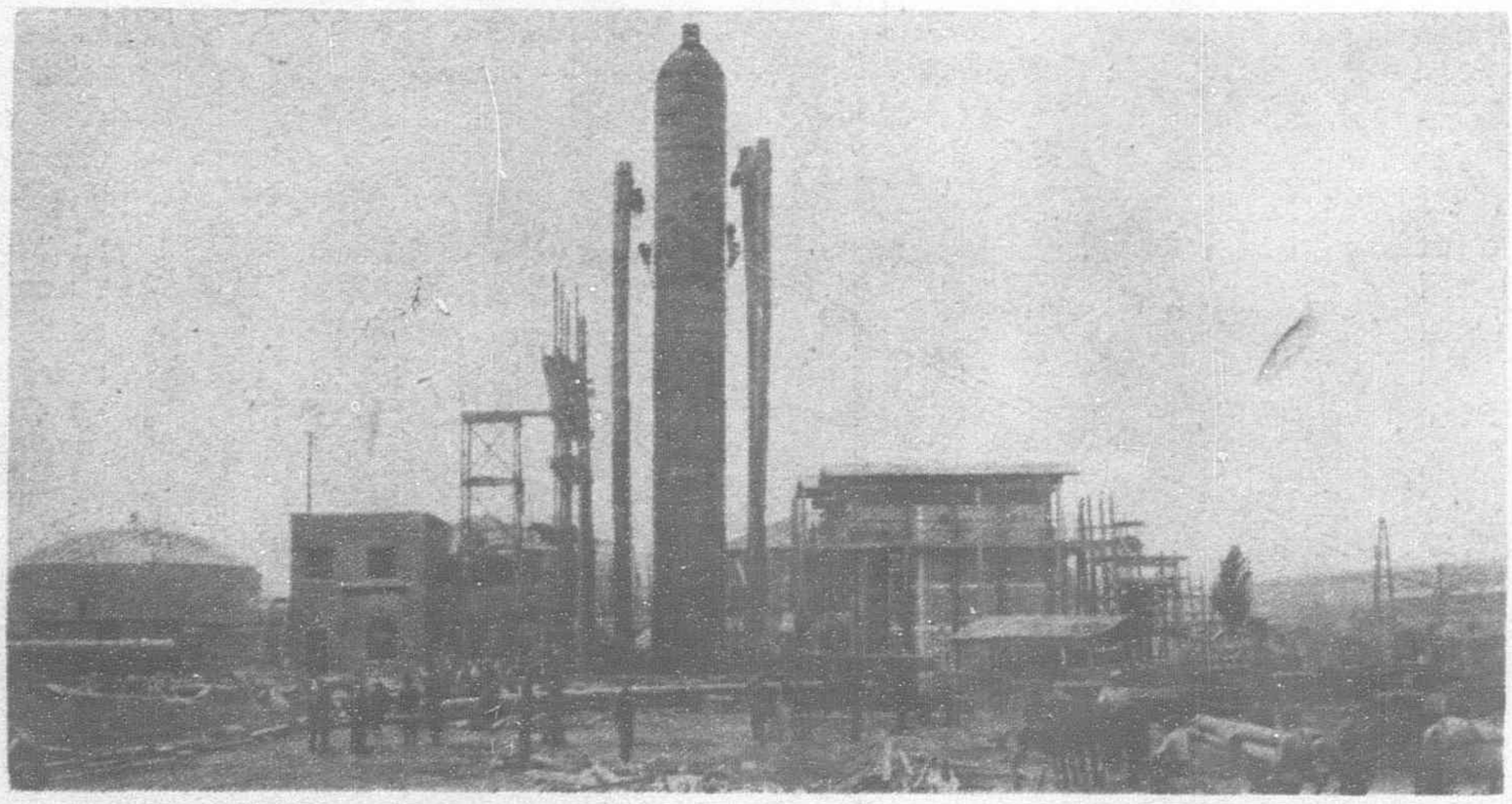
American Oil Installations

Six Foster Wheeler distillation units have been put in operation in Russia during the past six months. The first two of these to go into service are in the Grosny refinery of the Grozneft, second largest of three Russian oil trusts. The other four units were placed in operation this Summer, and are located in the Batum refinery of the Azneft, the largest Soviet oil trust. These six units have a combined throughput of approximately 60,000 barrels of crude per day which is fractionated into desired products in a single operation.

One of the units at Grosny is a two stage unit which fractionates 4,400 barrels of crude per day into gasoline, naphtha, kerosene, light gas oil, heavy gas oil, three lubricating oils and asphalt. The other unit at Grosny is a single stage unit which charges 15,000 barrels of crude per day and recovers continuous streams of gasoline, naphtha, kerosene, gas oil and fuel oil bottoms.

Three of the four units at Batum are identical in design and are erected in a single battery. Each charges 10,000 barrels of crude per day from which gasoline, kerosene, and gas oil are recovered, leaving a fuel oil residuum.

The remaining unit at Batum is a two stage unit and is the most interesting of the six erected in Russia. This two stage unit is made up of three sections; one an atmospheric section consisting of tube still and fractionating tower complete with condenser, heat exchangers, piping, pumps and other accessories for efficient operation. The other two sections are identical vacuum stages, each made up of a tube still and vacuum bubble tower complete with heat exchangers, condensers and pumps. Crude at the rate of 10,000 barrels per day is charged to the atmospheric stage where gasoline, naphtha, kerosene, and light gas oils are removed in continuous streams. The residuum *(Continued on page 136).*



This picture shows the ingenuity of the American construction engineer who supervised the erection of a 100 ton fractionating tower in Russia without any special tools. Four gin poles were used, each of which was made of several logs spliced together. Four horses operated each of three home-made winches, also made from spliced logs. Two of the winches were used for hoisting and one for retarding the lower end of the tower. This tower is the vacuum tower of the 4,400 barrel two stage Foster Wheeler unit at Grosny, Russia. The atmospheric tower can be seen on the ground in left background.

Automatic Traffic Control System is Adopted in Japan

*By Y. SHIMIZU (Sales Manager, Tokyo Electrical Company)

A MARVELOUS change has taken place in the regulation of street traffic in Japan. Still on the way of recovery from the havoc done by the great earthquake in 1923, Tokyo had experienced a serious increase in traffic accidents during the last few years, due to the rapidly increasing use of automobiles. In the past, street traffic had been allowed to take pretty much its own course, but the automobile introduced the complication of mixing high-speed vehicles with the slow-moving hand carts, ricshas, ox-drawn and horse-drawn carts and thousands of bicycles which together with trolley cars and pedestrians filled the streets.

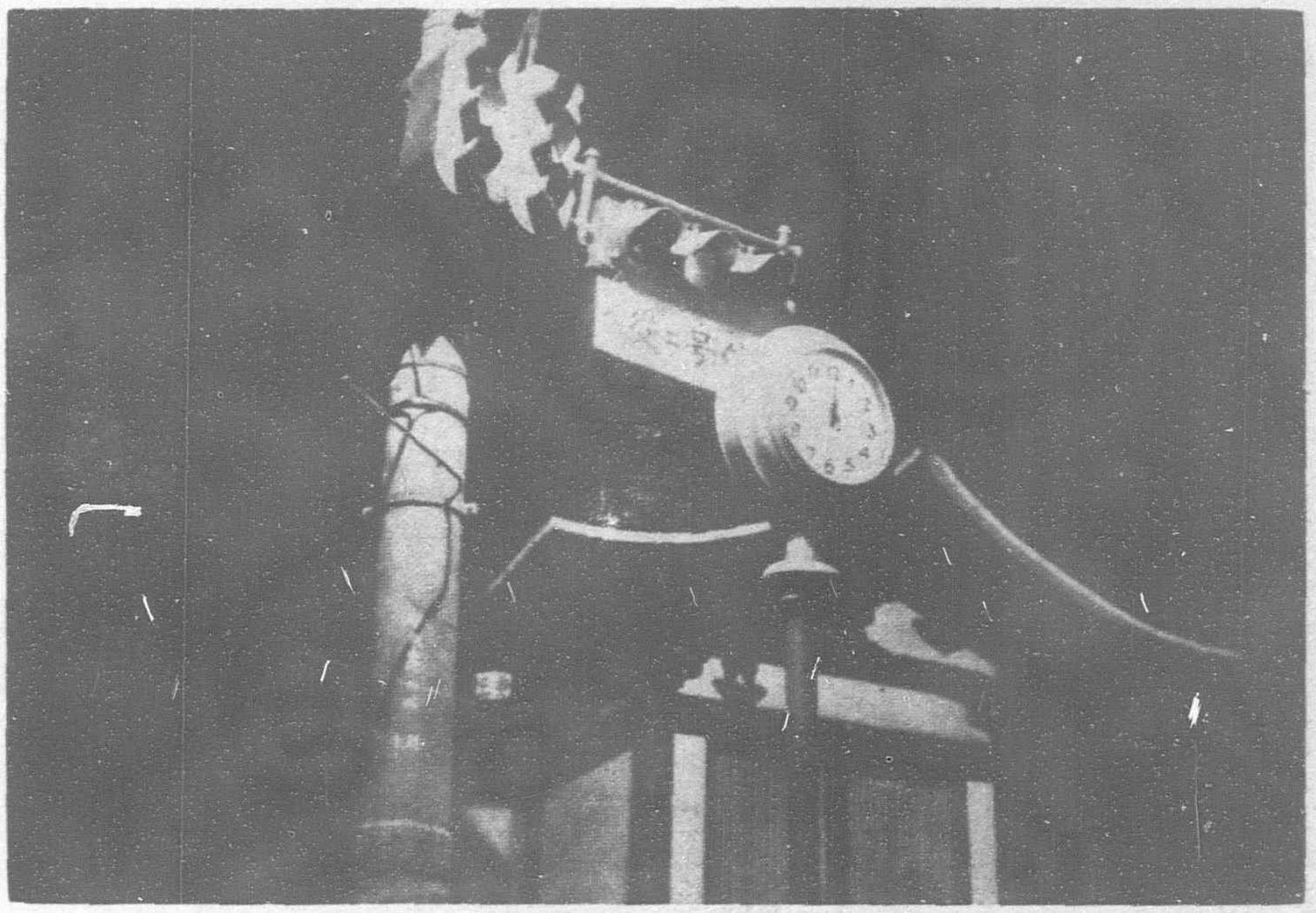
In its endeavor to safeguard this heterogeneous traffic, the city of Tokyo first introduced hand-operated signals and these were used for some time by traffic officers guided by their own judgment. Several years passed before definite steps were taken to make the regulation automatic.

Last August the city authorities decided to install modern traffic lights at a number of congested street crossings, and equipment of the Tokyo Electric Company was chosen. That company's illuminating engineering department had given close study to the subject for a number of years and had brought over to Japan the system developed by the General Electric Company to which it applied such minor modifications as necessary to meet local conditions.

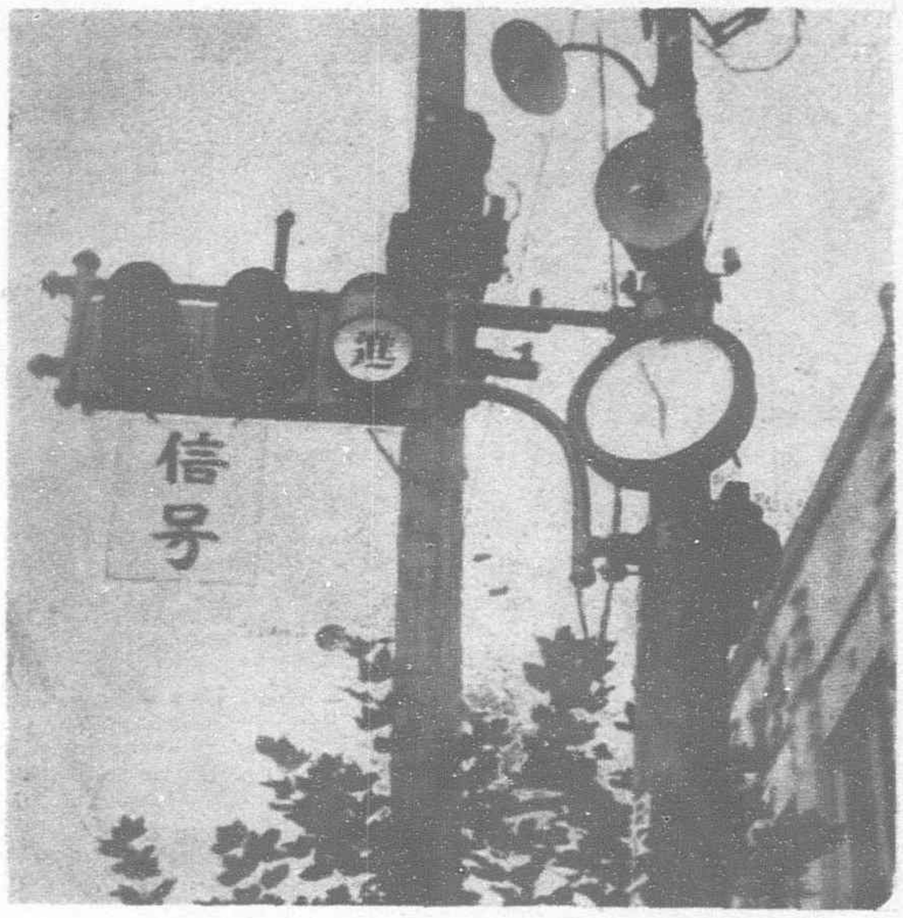
Tokyo's first installation of this up-to-date system are along the chief business thoroughfare, Ginza. At the Ginza 4-Chome crossing, 3-color, one-way horizontal bracket signals are used, and the crossings at Kyobashi Okachimachi and Jinbo-cho make use of 3-color, 4-way pedestal type signals.

These locations mark a busy shopping district and indeed Ginza 4-Chome corresponds to Times Square in New York. It is the intention to extend this traffic signal system to other important points.

The city of Kyoto has also adopted equipment of the Tokyo Electric Company and has applied it to a score of street intersections using 3-color, one-way horizontal bracket type signals. Osaka, seeing the good results elsewhere has put in a number of signals on a trial basis and a general trend toward the adoption of automatic traffic control is evident in the prominent cities of Japan.



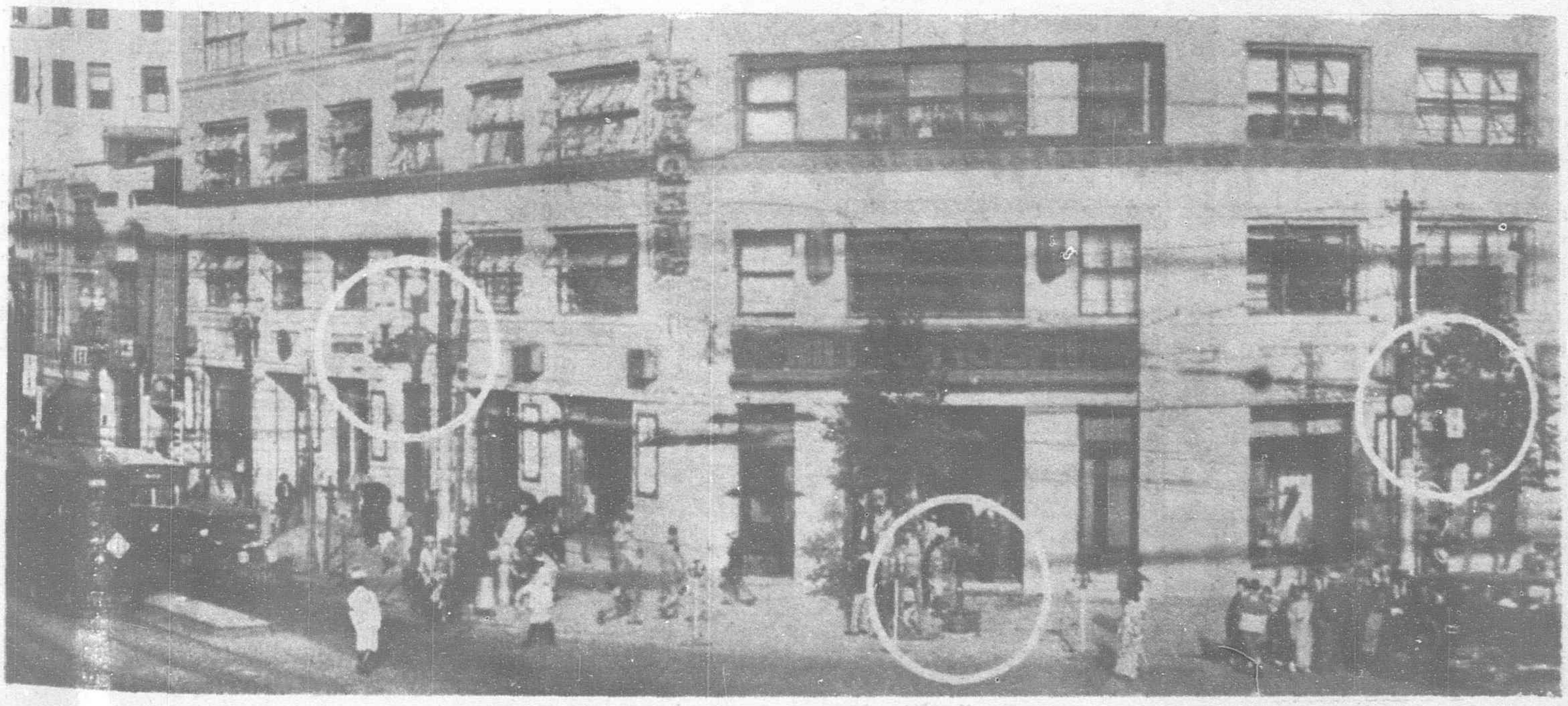
Bracket Type Signal in Kyoto



At a Corner of the Ginza, Tokyo

*The Digest.

(Continued on page 151)



Where the Ginza is Crossed by 4-Chome, Tokyo

Diesel-Electric Locomotives for Siam

Royal State Railways Service is Modernized with Equipment Supplied by Messrs. Frichs of Aarhus, Denmark

THE firm of Messrs. A/S. Frichs, of Aarhus, Denmark, have recently placed in service on the metre-gauge Royal State Railways of Siam thirteen new Diesel-electric locomotives and coaches. Operation of this new equipment is especially interesting because the locomotives and coaches, the power of which varies from 150 to 1,500 horse-power, will be operated in a tropical country, and the locomotives are being used on very long runs. An indication of the duties to be performed is the fact that the locomotive crews have to be changed *en route*.

Six of the locomotives are of 1,000 horse-power and one has 1,500 horse-power as a maximum, while the motor coaches are equipped with 150 horse-power Diesel engines. All the new equipment was constructed to the firm's own designs, based on their long experience with oil-electric construction.

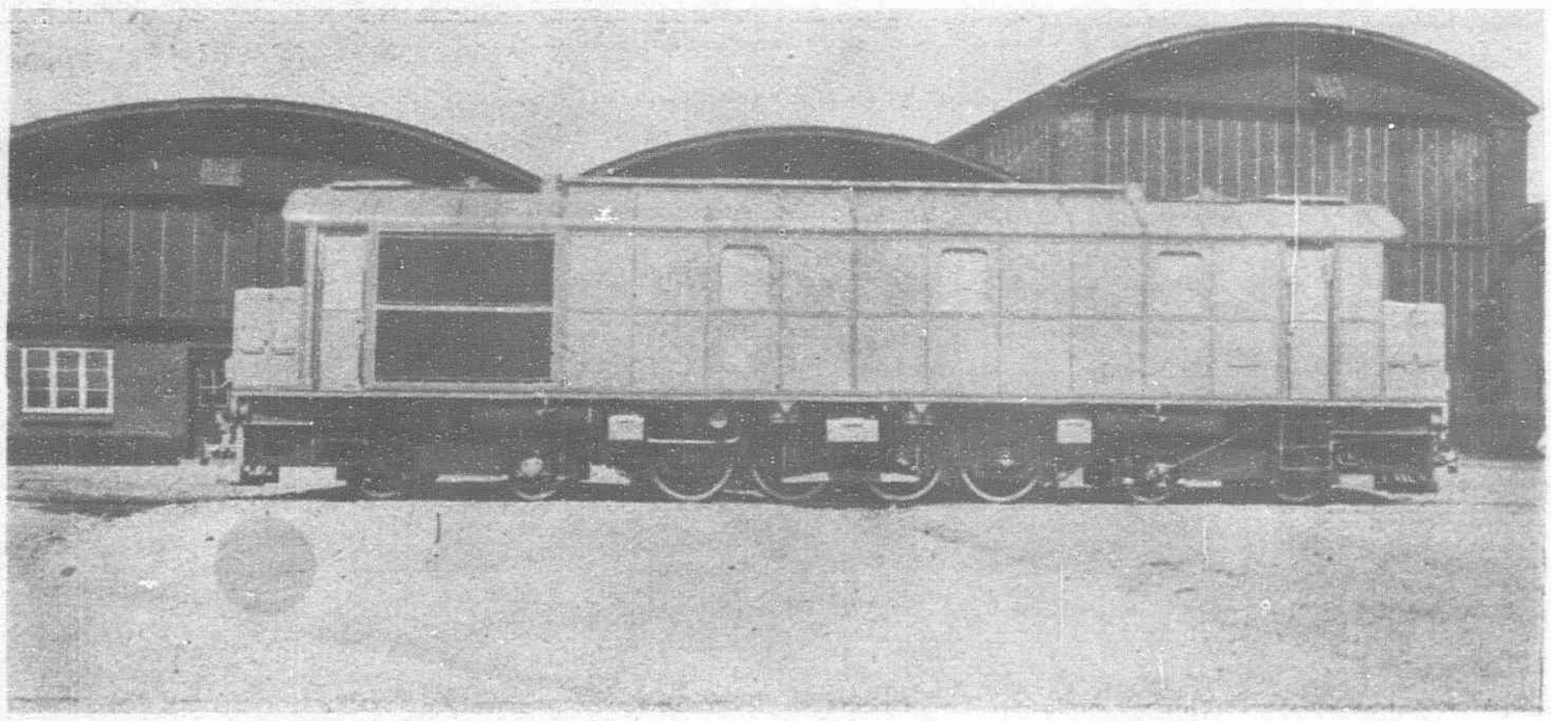
As may be seen from the illustration the 1,000 h.p. locomotives are of the 4-8-4 type, and each is equipped with two six-cylinder, four-stroke, single-acting Diesel engines, direct-coupled to a shunt-wound generator of 850-volts, and an auxiliary dynamo acting as exciter and also producing current for charging the battery of accumulators for starting and lighting purposes. The accumulators are arranged in casings projecting in front of the driver's cabs at each end of the locomotive. These casings also contain tanks for fuel oil. The traction motors, four in all, are connected to the driving wheels through spur gears.

The Diesel engines work on the solid-injection principle. They are totally enclosed and pressure-lubricated throughout, and form two self-contained units, each having its own complete set of coolers, pumps and filters. The two sets of machinery are fully independent of one another, and can be worked separately, one at a time or combined, as required.

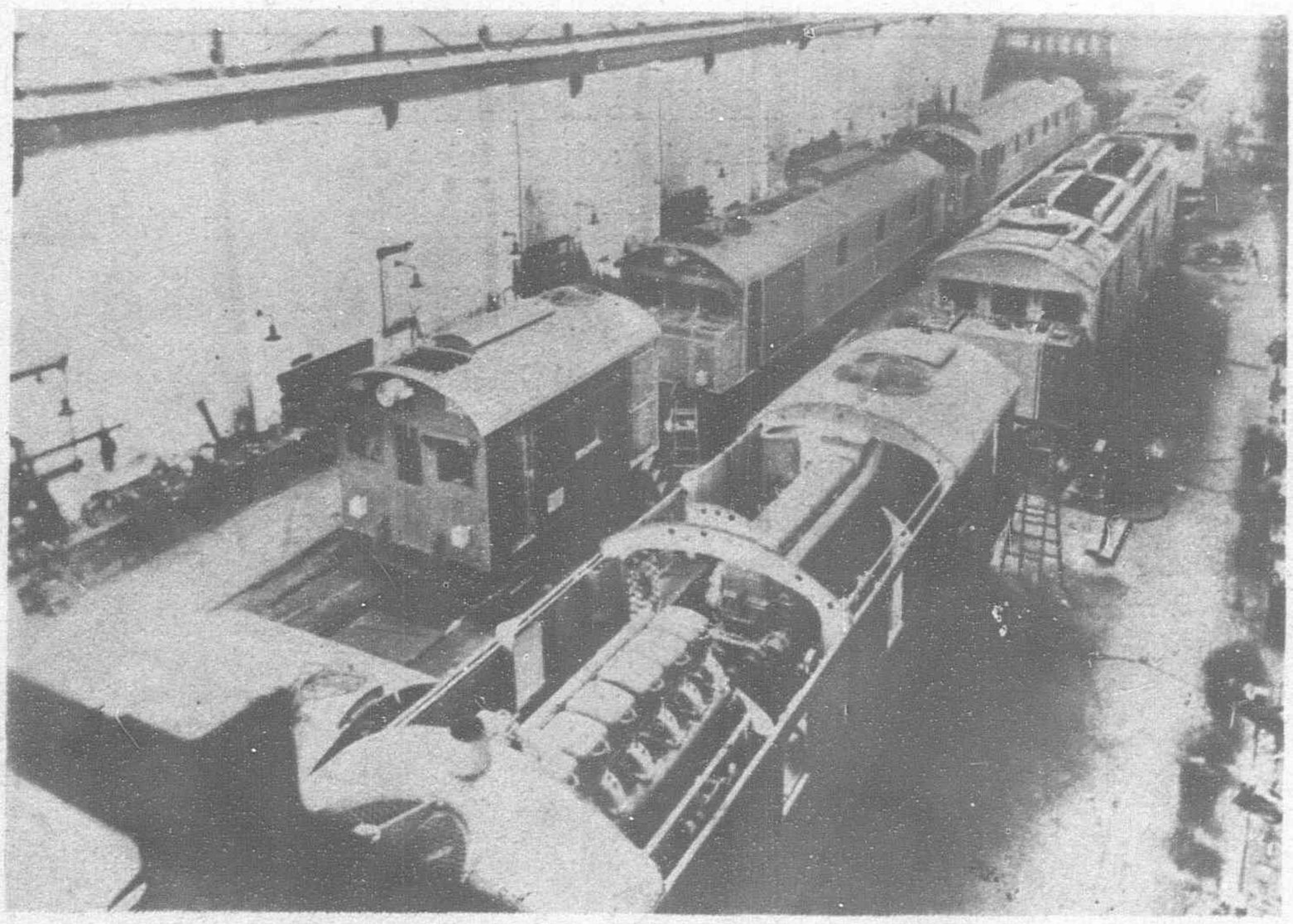
The engine room contains, besides the power plant, two electrically driven vacuum pumps for the brake system; one electrically driven air compressor for serving the pneumatic control gear, the whistle, and the sanding gear; and a small electrically driven pump for pumping the fuel from the main tanks to the service tanks.

The locomotive has strong outside longitudinal plate frames for its whole length, interconnected by substantial stiffening plates and engine bearers. The superstructure is constructed of rolled sections and steel plates.

At each end of the locomotive there is a driver's cab equipped with controls for the traction motors, press-buttons for starting, switches for lighting, etc., and also with measuring and indicating apparatus for tension, current, water temperature, and water and oil pressures, so that the driver, in addition to having the controls ready at hand, can also at a glance satisfy himself that everything is working well.



One of the six 1,000 h.p. locomotives. The cooler, which is seen on the left side, has proved to be very amply dimensioned as the temperature of the cooling water has been kept down, without difficulty, at the normal temperature



Interior of one of the Frichs' erecting shops. The nearest locomotive in the first row is No. 5—1,000 h.p. locomotive for Siam. The two next in the same row are two 1,000 h.p. locomotives for the Danish State Railways, while the rear locomotive in the second row is the 1,600 h.p. for Siam. The middle one is No. 6—1,000 h.p. locomotive for Siam, and the small one standing in front is a power truck for one of the Diesel passenger coaches for Siam

One of the most difficult problems is the cooling of the circulating water for the Diesel engines, since the cooling must be done by means of air at a temperature of 40° C. Therefore, the two cooling plants, one on each side, have been designed accordingly, and are supplied with electric driven ventilators.

The total length of the locomotive is 46-ft., and its weight 86 tons in working order. It has been built for continuous runs up to 1,250 miles, hauling trains of 420 tons, *i.e.*, 13 coaches, in express service between Bangkok and Padang Besar. These are international trains comprising sleeping cars and dining cars, and conveying the European mail from Penang to Bangkok and *vice versa*. The locomotive starting from Bangkok carries sufficient water and oil-fuel to run this train to Padang Besar and back again without re-fuelling or watering.

Fast Goods Working

The 1,500 h.p. locomotive is of the articulated 4-8-4 type, with a total length of 66-ft. It weighs 120 tons in working order, and its radius of action is 1,000 miles. This locomotive is being

used for fast goods traffic between Bangkok and Chiengmai, and is equipped with two Diesel engines of the same type as in the 1,000 h.p. locomotives.

The six passenger motor coaches are of a new design, each consisting of three parts—the power truck, the carrying truck, and the coach proper. The length of the coach is 62-ft. At the rear end it rests on the carrying truck, and at the front end on the power truck, thus forming an independent vehicle, consisting of a complete power unit with driver's cab and traction motors.

The Diesel engine develops normally 150 h.p., and is of the same type as the locomotive engines. The coach has seating accommodation for sixty passengers, and has another driver's cab at the rear end, so that it can be driven from either end.

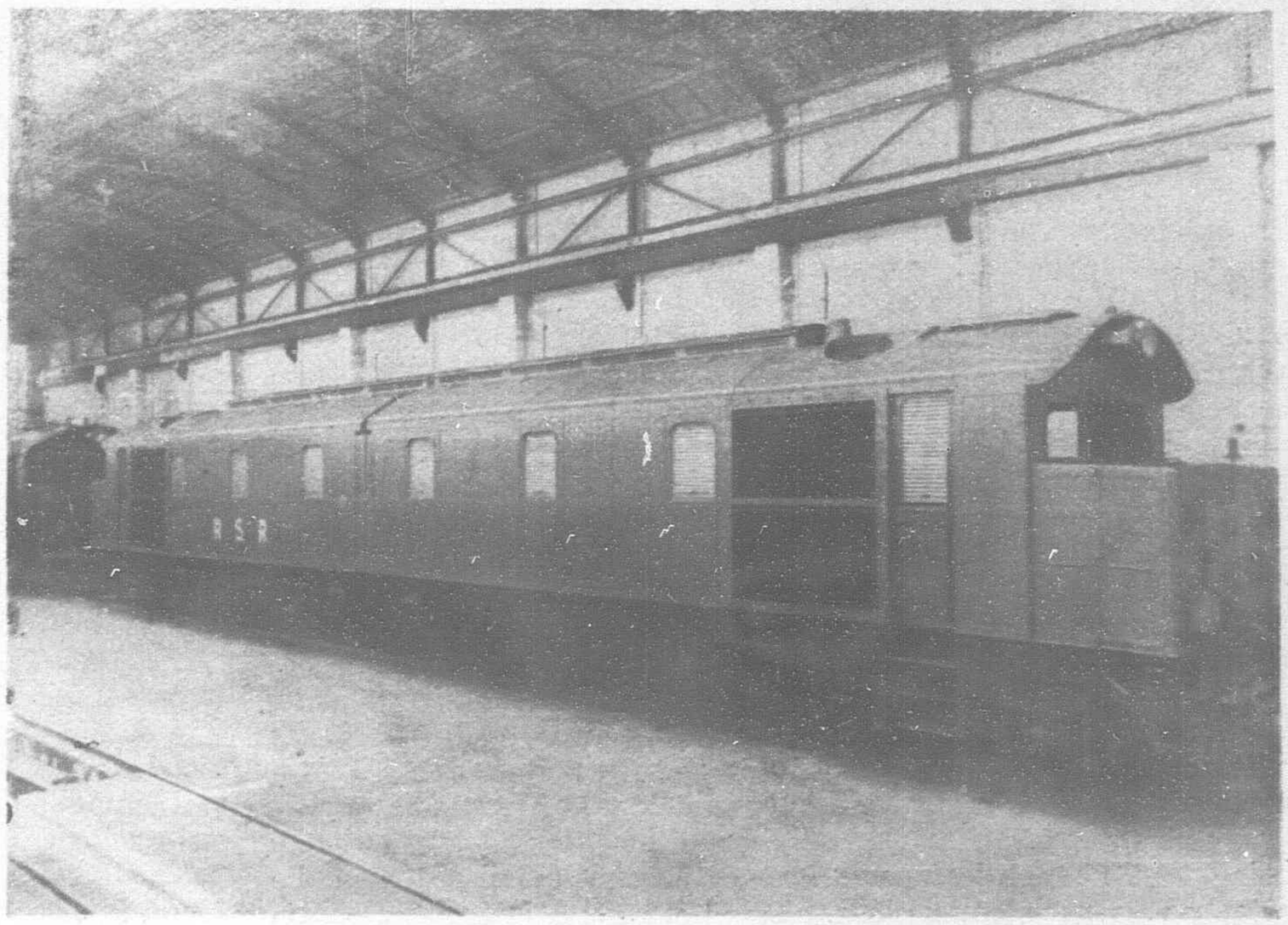
Owing to the new equipment the running time between Bangkok and Penang has been reduced by more than five hours in each direction.

New day and night coaches with single berth compartments form part of the express. Between some of the new compartments there are connecting doors.

These new coaches were built by the Aktieselskabet Scandia of Randers, Jutland. The compartments are in matt polished, natural color teak. Seats and cushions are upholstered in light buffskin and the floors covered with rubber. Each coach has two lavatories and a bath-room, and the ends are closed, so that passengers can move from coach to coach regardless of the weather. Other improvements in the express which may be noted include the provision of a restaurant car for second class passengers and a buffet for third class passengers. Sleeping accommodation for the restaurant staff has also been provided.

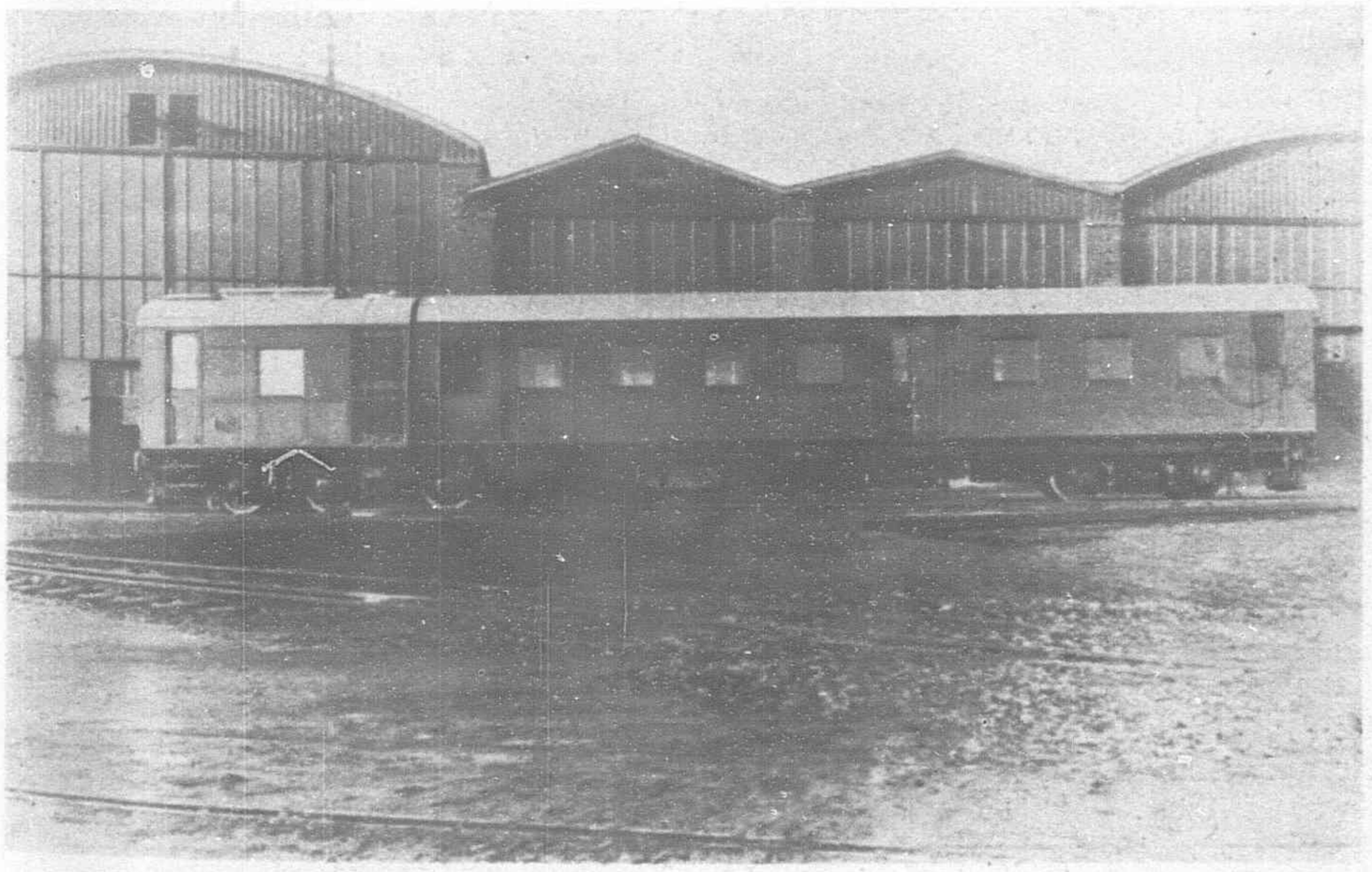
The new schedule and the new coaches allow the Railway to operate the international express between Bangkok and Prai and back with one set of rolling stock, and without the aid of F.M.S.R. sleepers as formerly.

Regarding the new Diesel-electric equipment The *Railway Gazette* says, two factors make these orders of particular interest.



The 1,600 h.p. locomotive for the Siamese State Railways. It is articulated in the middle, but the engine room appears as one room and the locomotive is one locomotive

One is that the climate of Siam is tropical, and the problem of cooling the Diesel engines is therefore considerably increased. The second is that some of the locomotives, of 1,000 h.p., have been specifically designed for working heavy, long-distance express trains, and others, which are of 1,500 h.p., are for heavy and fast freight trains. The same locomotive, starting from Bangkok, will work right through on the international express to Padang Besar and back again. The locomotive will carry sufficient fuel and water for the complete return journey without having to replenish on the way. This is a remarkable proposition for a metre-gauge line, and should lead to considerable working economies. The result of this large scale experiment on the part of the Siamese railways will be watched throughout the world with very great interest, particularly at a time when the claims of electrification for main lines are being pressed vigorously.



One of the six Diesel Electric passenger coaches for the Siamese State Railways, supported by one 4-wheel bogie and one 6-wheel bogie and articulated, so that all the machinery is erected on the power truck. This coach is equipped with 165/180 h.p. Diesel engine, only rated down for this special case to develop 150 h.p. normally

During the 75 years of its existence, the firm of Frichs has been building all types of power plant. First, steam engines were built, and later on, Diesel engines. In 1911 the construction of steam locomotives was begun, and it was, therefore, only to be expected that the firm should turn to the construction of Diesel engines for locomotive work. The first such locomotive had a 240 h.p. engine, and was for a private railway. It was put into service in 1926, and has up to the present covered 350,000 miles without giving any trouble whatever. The fuel consumption has been 1.2 kilos per mile, and the lubrication oil consumption 16 grammes per mile, whilst the cost of upkeep and normal repairs has been less than 2d. per mile.

Since then, the firm has delivered in all 22 Diesel-electric locomotives and coaches, which have covered a total of 3,000,000 miles. Frichs, of Aarhus, have standardized a whole range of Diesel engines for locomotive work, and, besides the 22 now in service, a further 30 are on order for different railways.

A CORRECTION

Messrs. Nichizui Trading Company of Osaka, Japan, have kindly called attention to a mis-statement made in an article in the January number of the *Far Eastern Review* on the subject Electric Power in Formosa which sets forth that a 10,500 kw. turbo-generator supplied by the AEG is "the largest machine running at 3,600 r.p.m. installed in Japan." In their communication Messrs. Nichizui Trading Company point out that in 1925 a turbo-generator of Siemen's make was installed at Sanno Chuo Suiden K.K., Shikama No. 2 Plant with an output of 12,500, kw. and in 1926 two Brown Boveri turbo-generators of 12,500 kw. were installed at the Saka station of Messrs. Hiroshima Denki K.K., both running at 3,600 r.p.m.

Mineral Resources of Kwangsi

HAVING no outlet to the sea, and being surrounded by the mountainous provinces of Kwangtung, Kweichow and Hunan (China proper) and the province of Tonkin (Indo-China), Kwangsi is one of the least-known provinces in the country. Although it figures but rarely in current records of economic activities Kwangsi, like other of the south-western provinces in China, is very rich in mineral resources. Geologically, the province is an extension of the Kweichow tableland, and consists chiefly of limestone and sandstone formations full of lodes and seams containing gold, silver, lead, iron, antimony, coal and other minerals of commercial value. The mining possibilities in Kwangsi province are most attractive, yet except for a few mines operated in a very primitive manner, they still remain possibilities, and there appears to be no immediate prospect of them becoming actualities.

Realizing the difficulties of the position, the provincial authorities of Kwangsi have taken steps to encourage the development of these resources by opening up likely mining areas to Chinese and foreign enterprise, the only condition regarding the latter being that no political conditions or special privileges will be attached to such concessions. The Kwangsi Provincial Department of Reconstruction, with the assistance of the Geological Society of Kwangsi, recently organized a number of survery parties to map out with as much detail as possible the nature and the extent of the mineral deposits in the province. The following details are taken from reports submitted by various pospecting parties after making careful expert investigations.

Coal

(1) Siwan, Hohsien district.—Coal has been found in the mountainous country beyond the Fuhochung tin mines known as Tachang. During the closing years of the late dynasty, this coal-field was being worked, and was in a very prosperous condition. The daily output amounted to 300 tons, and the colliery was well equipped with steam-driven winches, pumps and light railways. On the occasion of the Revolution in 1911 and the military operations which occurred during the opening years of the Republic, work was suspended, and the shaft has been closed ever since. According to information obtained from men who have worked in the mine, the thickness of the main seam varies from five to ten feet, with an inclination of about 40 degrees, while the depth of the shaft is 300 feet. If the estimate of a German expert is correct that the area of this coal-field is 60 square *li*, the mine is capable of maintaining a daily output of 300 tons for 80 years. The coal is of the bituminous variety, containing little sulphur but a high percentage of carbon and volatile matter, and is thus, of high industrial value.

(2) Sankiangkow, Kweihsien district.—Owing to inadequate communications, the bituminous coal found at Sankiangkow, about 10 *li* north-west of Shan Shih Lung Hu, and also at Lukow, near Sankiangkow, has never been worked. The Sankiangkow seam is three feet thick, while that at Lukow is seven feet. The Sankiangkow deposit is located in sandstone and shale of the carboniferous and permian periods, and the field extends 20 *li* southward to Mabantsun village, near Changmuhu.

(3) Ertang and Santang, Yunning district.—The coal-field found at Ertang, 20 *li* north of Yunning (formerly Nanning), and another near the Yunning-Benchow Highway, extends to Lintang, Wushihtsun village, runs under the river Santang, and ends at Kaolingshan. That part of the seam which goes under the river bed has been worked by local labor and sold in Yunning at 70 cents per picul, including cost of transportation. The explanation of this remarkably low price is the accessibility of the coal seam, which is three feet thick, and at this point is less than ten feet below the ground. The bed lies between white and gray shales, and contains many fossil remains of the tertiary period. The coal is of the brown variety, and contains a large percentage of water and volatile matter but little sulphur.

(4) Antehshan, Poseh district.—The mines at Antehshan, Itu and Shiatienli were opened by the Yungli Company, and several thousand tons were brought to the surface, but unfortunately work was interrupted by military operations, and has never been resumed. The coal is brown and contains a large quantity of volatile matter.

(5) Haiyuan district.—The precise spot in this district where coal has been found is still uncertain. According to careful experiment made by a French chemist with samples of coal from this region, it is of the variety known as "oil" coal. By distillation about 10 catties of crude oil can be extracted from 100 catties of coal.

(6) Tapu, Maping district.—Deposits in this place have been found near the river running from Liuchow or Maping to Chongon. The coal is bituminous, and contains a large quantity of volatile matter as well as sulphur.

(7) Liucheng, Loshing, and Tienho districts.—The coal located in these regions is scattered all over Shatang, Liucheng district; Sinhu, Maping district; Taipingtsun village and Shimen, Loshing district; Kulungkang, Tienho district; Tehchiao, Ishan district; and Yungkiang, Loyung district. The deposits are all of the anthracite variety, and contain a large proportion of sulphur.

(8) Changling and Fenghuangshan, Pinglo district.—The coal found in these deposits contains a little sulphur. It is widely used in the local lime-kilns, and it is hoped can be also consumed for other purposes.

(9) Liyuling, Laiping district.—This coal mine was opened by the Kwangi Company, but as no investigation has been made, neither the quality of the coal or the output is known.

(10) Peishakiang, Pokpak district.—This place is located about 10 *li* from the walled city of Pokpak, and coal deposits have been found along both banks of the river. The seam is about two feet thick, and brown in color. As there is no demand for this fuel in the neighborhood, the deposit has not yet been worked.

From the above facts it appears that although the coal deposits in Kwangsi are not so abundant as in other parts of the country, such as Manchuria, Hopei (formerly Chihli), and Shansi, yet they are more than sufficient to meet the local demands. At the present time most of the coal used in South China is imported from Formosa which is cheaper than that produced by the Kaiping and Fushun collieries. Since the quality of the brown coal in Kwangsi is similar to that imported from Formosa, while the quality of the bituminous coal produced by the Siwan mines is superior to the imported fuel, it only needs close co-operation between the Government and the people to open up the coal deposits in Kwangsi, with the prospect of most profitable results.

The following table shows the result of chemical analysis of coal found in the various localities mentioned above :—

Location	*Nature of Coal*	*Water*	*Volatile Matter*	*Carbon*	*Sulphur*	*Other Foreign Matter*
Siwan	Bituminous	1.60	28.50	62.00	0.30	7.60
Tapu	,,	0.50	26.30	57.20	6.47	9.53
Under Santang river-bed ..	Brown	19.60	36.40	32.50	1.28	10.22
Ertang	,,	18.30	32.40	47.00	1.00	1.30
Kweihsien ..	,,	12.50	34.50	35.60	1.24	16.16
Szeloh	,,	14.40	19.40	40.20	1.84	24.16
Hoshan	Anthracite	3.40	6.80	76.50	8.00	5.30
Taiping Village ..	,,	3.52	2.44	89.62	1.21	3.21
Shimen	,,	5.04	1.37	86.58	3.04	3.07
Wulichiao ..	,,	5.94	12.94	52.32	—	28.70
Kulungkang ..	,,	4.54	2.29	89.79	—	3.38
Sinhu	,,	7.00	6.00	81.00	2.30	3.70
Shatang	,,	3.50	8.50	47.00	—	41.00
Liangmu ..	,,	3.40	2.00	90.50	1.80	2.30
Tehchiao ..	,,	2.37	10.28	56.94	—	30.41
Yungkiang ..	,,	1.15	9.57	54.05	—	35.23
Changling and Fenghuangling	,,	6.78	1.26	87.00	1.80	3.16

Iron

(1) Kaoshantang, Henghsien district.—Deposits of iron-ore have been located behind Kaoshantang village, near Nanhsianghu. The ore obtained from this mine is of two kinds, hematite and limonite (or brown hematite), both being found in the sandstone strata.

(2) Huanghwakang, Hohsien district.—Iron-ore has been located at the foot of Kuposhan, near Panluhu among limestone and igneous rocks. The ore is of two kinds, magnetite and limonite, and both are locally used in making iron caldorns, the annual output of which is considerable.

(3) Liukiang district.—Near Hoshanling, Liukiang district, there are hematite deposits. The color of the ore is like silver, and first discovered by the simple countryfolk was believed to be that metal.

(4) Tungpao, Luchwan district.—The limonite found at Tiehshakang and Taniuling, Luchuan district, is used locally by ironfounders in making caldrons. The output of the mine has not been ascertained, but the ore is known to be very rich in iron content.

The following is a list of the limonite deposits in Kwangsi which have not yet been investigated: In the vicinity of Poseh district; Tashaikow, Chungtu; Mawan, Henghsien district; Luchwan district; Hoshaochiao, Chuanhsien district; and Szeting, Junghsien district.

Iron Pyrites

Iron pyrites are very useful for manufacturing sulphur and sulphuric acid. Occasionally the ore contains traces of gold and silver, in which case the tailings are sold to metal refiners, who recover the white and yellow metals. The following deposits of iron pyrites have been located:—

(1) Luling, Kweihsien district.—Iron pyrites is found near Luling village, south-west of Lungshanhu. The lodes, measuring from two to six inches in thickness, eastward parallel with the granite. The pyrites occur in large blocks, mixed with quartz.

(2) Taiping village, Loshing district.—The deposits in this region are found 30 feet below the coal bed. The pyrites, about four feet thick, are between the limestone, sandstone and shale. The deposit is being worked, and over 1,000 catties of sulphur are turned out every day.

(3) Pumiao, Yunning district.—Here iron pyrites is found scattered in the crystallized limestone. According to assay, every ton of ore contains 28 ounces of silver and traces of gold.

(4) Lungtsou, Fengyi district.—No effort has yet been made to work this deposit, though assay shows that every ton of ore contains about 24 ounces of silver and a little gold.

(5) Peishakiang, Pokpak district.—Iron pyrites is found here scattered along the banks of the Peishakiang River, 8 *li* from the city of Pokpak. As no assay has ever been made, the amount of gold and silver contained in the ore is not known, but a limited quantity of placer has been found in the same district.

The following are some of the iron pyrites deposits in Kwangsi which have not yet been investigated: Nawantsun, on the border of Kweihsien and Wingshun districts; Hsincheng district; Northern section of Moyun district; Lungsheng district; Henghsien district; Kweihsien district; Lungchow; Yinshunkong of Chotung, Wuchow district; Lichuidi, Watlam district; Nanmientang of Suihungchen, Pokpak district; Tashan of Pakpao village, Matouhu district; Minkiang district; Taipingshan, Kweihsien district; and Huangyuantsun village, Kuhwa district.

Gold and Silver

(1) Sancha, Kweihsien district.—Rich mineral deposits have been located 18 *li* north-west of Lungshanhu, northern suburb of Kweihsien district. There are two parallel lodes about 30 feet apart, the width of the eastern lode being over two feet, and that of the western, over three feet. This deposit contains argentite, chalcopyrite, bornite, and calcite in sandstone and shale of the Cambrian period. The richest ore contains 20 per cent of copper, and every ton contains about 90 ounces of silver and half an ounce of gold.

(2) The central section of Fengi district.—In this area there are more than 10 places known to have gold deposits. Between 1921 and 1925, all of them were being worked, and the total output amounted to over 1,000 *liang* per year. At present only six of these workings are in partial operation, and the yearly output has been reduced to less than 100 *liang*.

(3) Kinsingwei of Chotung, Wuchow district.—The rocks in this region consist of phyllite of the Palarozoic age. Although the placer gold formerly found in the valley of Chotung, 30 *li* north of Wuchow, has been exhausted, the main deposits of ore, located in the high mountains of Kinsinwei, are still untouched.

(4) Linkiang, Yunning district.—The country in this area abounds in grantie, and although the lode has not been located, placer gold has been found near the bend in the Linkiang River, 20 *li* north of Linlihu.

(5) Peishakiang, etc., Pokpak district.—Seven placer gold deposits have been discovered in this locality, as follows:—(1) Sanpukiang, eight *li* from Pokpak, (2) Kinkangyung in Chowwangtu, Lungtanchen village, 140 *li* from Pokpak, (3) Choyung, near Kinkangyung, (4) Kintsun in Linchiaohu, Shahochen village, 130 *li* from Pokpak, (5) Sinaudi in Yungmochen, Tahuangpao, 80 *li* from Pokpak, (6) Chatang in Sanpukiang, Sankinpao, 20 *li* from Pokpak, and (7) Huangchitung in Sanchinpao, 50 *li* from Pokpak.

(6) Kuahung Mine, Tashan of Nantan district.—This deposit, about 40 *li* long, consists of silver-bearing graphite and tin. This mine was in a prosperous condition during the closing years of the recent dynasty, when the yearly revenue received by the local likin station amounted to Tls. 140,000. During the early years of the Republic work was suspended, owing to interruption by military operations, and mining has not yet been resumed.

In conclusion, it may be assumed that all the known placer gold deposits in China have been nearly exhausted, owing to their accessibility and simplicity of working. Gold-bearing quartz lodes, however, deposits of iron pyrites, copper and silver-bearing lead are still mostly untouched, and what is needed now is to apply modern mining methods in order to recover this gold and silver.

Tin

(1) Fuhochung Mines.—This field, 80 *li* long and with an area of 600 square *li*, includes three separate mines—Lungkow, Chuangtow and Pingti. The Lungkow mine is situated among limestone and granite rocks, and the average output is three or four *liang* of tin from every 100 catties of cassiterite. The Chuangtow deposit is located on the surface of the limestone rocks, and the output is about one *liang* of tin from every 100 catties. The Pingti deposit runs under the river bed, along the sea-beach, and into the open country. The average output is from two to eight mace of tin per 100 catties. Of these three mines the most highly developed is the Chuangtow, as the ore can be obtained by the simple process of washing the sand without the labor of digging through rock as at Lungkow mine. The Pingti deposit has been left unworked as there is no machinery available to bring up the sand from deep water. The three mines are estimated to be capable of yielding over 10,000 tons of ore annually, but at present are producing only 70,000 catties per annum.

The following list shows the mining areas owned by the Fuhochung Tin Mines as surveyed in 1927:

Location	*Area Surveyed (Mow)*	*Area Being Worked (Mow)*	*Area Staked Out for Operation*
Waungkao	11,515.30	1,353	25%
Sungmuchai	12,119.87	1,353	25%
Litou	20,090.32	2,088	20%
Suiyenchu	10,026.30	1,675	20%
Muyuantow	2,317.00	1,675	20%
Wukungsui	3,385.00	—	5%
Sintsunping	8,496.09	—	20%
Panlutuan	9,630.60	—	15%
Lientang	2,177.09	—	—
Peisha	8,789.70	—	—
Miaowan	6,331.00	—	—

(2) Nantan, Tachang, etc.—According to a survey made by the Geological Society of Kwangtung and Kwangsi, tin deposits have been found in Tachang, Tashan, Huilokong, Malutung and Lofu. Tachang, 70 *li* from Nantan, 30 *li* from Achuho and 120 *li* from Hochin, produces two kinds of ore, cassiterite in blocks and tin sand. The former is found in Changpo, while the sand is found in Lungtowchang. The Changpo cassiterite is dark gray in color, opaque, and is found mixed with iron pryites, grey antimony and calcite in the quartz rocks of the lower carboniferous strata, but the size and shape of the lode is very irregular. The average output of tin is about 10,000 catties of ingots per month.

(3) Lungtowchang.—The tin deposits of Lungtowchang, 7 *li* south-east of Changpo, are found in the form of sand mixed with broken granite and quartz. The bed is a residual deposit of

considerable thickness, but owing to the difficulty of getting sufficient water to wash the sand, the output of tin from this mine is negligible.

(4) Chowwangpao, Pokpak district.—This place is 140 *li* south of Pokpak, and tin sand is found under the river-bed and extending for some distance beneath the open fields. The bed varies from one foot to three in depth. The rocks in this district are mica schist, with a mixture of mica and granite pegmatite. Since the whole mineral area is only about 300 *mow* is extent, large-scale operations are not called for.

The tin-mines of Kwangsi come next in importance to those of Yunnan, which, with a yearly output of 7,000 tons valued at about $30,000,000, is considered the third largest tin-producing territory in the world. Since the Fuhochung mines of Kwangsi are very similar in character to those in Yunnan, their output should be of equal size and value with the gradual introduction of improved methods and machinery, and adequate means of communication for transporting the metal from the mines and smelting works to the coast.

Manganese

(1) Sanlichu, Mosun district.—The most important manganese mines in Kwangsi are located at Sanlichu, 30 *li* east of Mosun district. The yearly production of ore usually amounts to 20,000 tons, but owing to difficulties in regard to transportation there was an accumulation of stocks, and the output last year was curtailed very considerably, only a few thousand tons being marketed. It is estimated that about 70,000 tons of manganese ore has been already mined, and the amount remaining is estimated at 80,000 tons. The strata of the basin-like terrain at Sanlichu are formed by the alluvium of the lake, and the thickness of the manganese deposit is irregular. The average depth of the bed is between three and four feet, though one part of the deposit at Matsunwan is over 30 feet deep, and another in Hengling is more than 10 feet in thickness.

(2) Mokwei, Kweiping district.—The manganese produced in Mokwei is disposed of at Kiangkow, and these deposits are sometimes called the Kiangkow mines. Although the output is not so large as that of the Sanlichu mines, last year's production was considerable, amounting to between 4,000 and 5,000 tons. All the mines produce psilomelane except in the Tanputang field, opposite Paotien village, where pyrolusite powder is found, but unfortunately this powder contains a high percentage of organic matter and cannot be sold at a good price.

(3) Pitan, Kweiping district.—Pysolusite deposits are found at Huangmaoying, 20 *li* from Pitan; Yiaochuyung in Wupingli, 20 *li* from Pitan; and Changsunshan, 8 *li* from Pitan. The pyrolusite deposits at Huangmaoying and Yiaochuyung are from one to two feet thick, and mixed with mud in the sandstone rocks. These deposits have been only recently discovered, and no information of their area or quality is yet available.

(4) Ziatsun, etc., Laipin district.—Manganese deposits are found in Newlanshan, near Siatsun; Saikuling, Lunganyu; Lukungshan in South Erlitun; Kaoer and Kaoyi, North Sanlichu; and Chertungku and Feioban in Chilintsun, North Wuchu. Although these deposits have all been worked, the output of ore is unknown.

(5) Luchu, Maping district.—Manganese deposits have been located at Mahanling, Chuyiaoling, Munkowling, Fengmener in Lukaoling, North Kaoerling, and Kaoyiling. According to reliable reports, the output from these deposits is abundant.

(6) Siaolu, Henghsien district.—Manganese deposits have been found among the metamorphic rocks at Siaolu village, near Paihoyu. The ore is a mixture of manganese and iron, and is found in blocks of different sizes scattered in the red clay. The output from this mine is reported to be considerable, but details are lacking. At Mapochiao, 20 *li* south-east of Henghsien district, manganese deposits have been also found.

Manganese ranks second in importance among the exported mineral products of Kwangsi, and over 10,000 tons of ore, valued at $200,000, were exported last year. If modern scientific methods were used in working the mines and adequate means of transportation provided, the total amount of ore produced is estimated at from 30,000 to 40,000 tons per annum.

Antimony

(1) Achuho, etc., Hochin district.—Antimony deposits are found in districts 30 to 40 *li* from Pamienshan in Achuho. Until 1921 the mining industry was quite prosperous, but mainly owing to the great slump in prices production slackened, and business has remained quiet. In 1927 the export of antimony ore remaining in stock amounted to over 1,000,000 catties. At present only the deposit in the region of Fujungchang, 30 *li* south-east of Hochih district, is being worked, the monthly output of ore amounting to 80,000 catties. The Fujungchang deposits are located at Paoyehshan Neuweishan and Paoshihshan, where grey antimony is found mixed with iron pyrites.

(2) The central district of Fengi.—In this region placer gold is often found together with antimony ore, which is white with a brown outer skin. The ore consists of antimony oxide, but sometimes contains antimony sulphide. During 1915-1916, owing to the great demand for war purposes, this mine was very prosperous, its product being sold at a higher percentage of metal. In 1927 the ore exported amounted to over 300,000 catties. At present many mines in this district are being operated by large companies, and a very largely increased output of ore is expected in the near future.

(3) Chienfengshan, Penyang district.—The deposit located at Chienfengshan, in Sintsun village, contains grey antimony, antimony oxide and quartz. The geological formation here consists of metamorphic sandstone of the Palaeozoic age, and the lodes all run from south to north.

(4) Lungkoshan, Penyang district.—This deposit is located at a spot 15 *li* south-east of Litanghu, among sandstone and shale of the Devonian period. There is only one lode, which is about three feet across, and contains grey antimony and quartz, with a small quantity of antimony oxide.

According to careful investigations which have been made, it appears that although there are many antimony deposits in Kwangsi, they cannot yield large profits owing to high transportation expenses, shortage of fuel, and difficulty in getting the essential materials for smelting the ore, such as soda-power, etc. Only by improving means of transportation, and so helping to solve other difficulties, can the antimony deposits in Kwangsi be extensively developed.

The following is a list showing the stibnite deposits in Kwangsi which have been located, but not investigated as to area and quality:—Szelin district; Chenlungshan, Henghsien district; Wingshun district; Tugi; Nachitsun, Siangtu district; Enlung district; Tienpingshan Kweihsien district; Lowshantung of Hsiahoszehu, Hochi district; Tienpaotung of Tuloi, Hochi district; Chuchupo of Wuhu, Hochi district; Ining district, and Pomengshan, Chuanhsien district. A deposit of autimony oxide has been found at Napo, Fengi district.

Copper

(1) Chuansintsun, Henghsien district.—This deposit is situated 15 *li* west of Taohu, north-west of Henghsien district, and is composed of calcite, malachite, azurite, and chalcocite. At present the mine is closed, after a short period of operation a few years ago.

(2) Sancha, Kweihsien district.—Every ton of ore produced in this region contains 20 per cent of copper, 90 ounces of silver, and half an ounce of gold. The mine is now being operated by the Paofeng Company.

(3) Tamingshan, Moyun district.—The ore forming this deposit is composed of calcite, iron sulphate, malachite and chalcocite, and contains only 8.5 per cent of copper. Assay of samples from a newly discovered chalcopyrite deposit at Wuming show the content to be 26 per cent of copper with 16 ounces of silver and a very small amount of gold in every ton of ore. The exact location of this deposit is not known.

(4) Pintung, Wuming district.—This deposit is located at Pintung, 15 *li* from Talintsun village, 20 *li* north-west of Mosun. It consists of azurite and malachite, and it is believed that a large amount of chalcocite can be obtained from the deposit.

(5) Mayangtsun village, southern section of Teinpao district.—The composition of this deposit includes malachite and chalcocite. Although the working of this mine has been started by a group of merchants, work was interrupted owing to difficulties in communications.

The following is a list of copper deposits in Kwangsi which have not been investigated:—Chalcopyrite.—Chenlungshan, Henghsien district; Penyang district; Enlung district; and Tienpingshan of Lungshanchu, Kweihsien district. Malachite.—Aotowling, 30 *li* from Chungdi, Yingling district. Chalcocite and Malachite.—Watlam and Peiliu districts.

Lead and Zinc

(1) Chenkiang, Kweihsien district.—A deposit located in Chenkiang village, 10 *li* from Mutsihu, consists of galena and quartz, but was abandoned after a short period of operation.

(2) Siaoshanhuang, Kweihsien district.—This deposit is located 10 *li* north of Tungyuanhu, and the lode is over two feet wide. The galena found in this region is mixed with calcite and quartz, but since the ore is not concentrated, working has been abandoned.

(3) Kiangchentsun village, etc., Mosun district.—A very extensive deposit has been located in the region bounded by Kiangchentsun village and Pintung in the south and north, and Siaoling and Shumsiangshan to the east and west. The area from south to north is 20 *li*, and from east to west, 8 *li*. The deposit is among limestone rocks, and contains galena, zincblende, calcite, etc. The most extensively worked part of this deposit is in the neighborhood of Hwayuling, north of Kiangchentsun village, but the unworked parts of the area are still numerous. The better quality of the ore obtained contains 60 per cent of lead, and there is a yield of six ounces of silver in every ton of ore.

(4) Kaoshanling, Wingshun district.—This deposit is located 20 *li* north-west of Kantanghu, in sandstone and shale. The lode contains calcite, galena and chalcopyrite. It was abandoned after a short period of operation.

(5) Foshaling, Yunning district.—This deposit is near Chowtsun village, south-west of Yunning district, and is found in sandstone, shale and phyllite. The lode contains galena, zincblende and crystal but no details of the yield are available.

(6) Kaishan of Taninghu, Hohsien district.—The lead deposit at Kaishan, east of Taninghu, Hohsien district, yields a large amount of ore every year. It is operated by primitive methods, and the working has been found very profitable to the operators.

(7) Tashan, Nantan district.—The Kuahung mine at Tashan, where there are ore deposits in an area about 40 *li* long, produces both lead and tin. Although extensively operated during the late dynasty, working was interrupted by the military operations attending the revolution, and has not been resumed. Silver-bearing lead deposits are found both at Chutsodai of Tachang; and Luchaowo in Achuho.

The following is a list of lead and zinc deposits in Kwangsi which have not been investigated :—Galena.—Kweihsien district; Lutsing, Tungchen district; Henghsien district; Lulotsun village, Wingshun district; Lukwei, Moyun district; Kinshan, Kweihsien district; Peisha, Fuchwan district; Chukaitsun village, Suilu district; Tienpingshan and Lungshan, Kweihsien district; and North section of Hungchaping of Taohwaching, Kwanyang district. Zincblende.—Mingkiang district; Chinsi district; Peihsiang, 40 *li* from Kweihsien district; and Henghsien district.

Bismuth, Tungstite and Molybdenum

The total area of these deposits in the hills 5 *li* east of Kaotinyu, 60 *li* south-west of Penyang district; and east of Malingyu, 12 *li* north-west of Kaotienyu, is five or six square *li*. The granite rocks contain orthoclase, quartz and biotite, and the ore is found in many radiating lodes. The deposits contain bismuthglance, chalcocite, iron pyrite, tungstite, and a very small amount of molybdenum, while quartz and achroite are also found. Although details of the output from these deposits are not available, the total is estimated at about 70,000 catties. The following table shows the output in catties of four mining companies in Kwangsi during the years mentioned :—

		White Bismuth	*Blue Bismuth*	*Tungstite*
Yiho	1926	15,789	2,320	6,680
	1927	10,349	1,555	100
Chunyi	1926	12,398	27	—
	1927	6,603	920	—
Yingshen	1926	4,417	1,229	1,400
	1927	1,641	932	—
Topao	1927	3,500	—	—

Non-metalliferous Deposits

The following is a list showing the various non-metalliferous deposits in Kwangsi which have been located :—

Asbestos.—Lungan, Loshing district; Yungmuchen of Tawangpao, Pokpak district; and Junghsien district. Achroite.—Kaotienhu, Penyang district. Native Sulphur.—Kweichowseng district. Crude Oil, Kerosene and Shale.—Chimuchung of Lungli, Kweichowseng district. Nitre.—Kweichowseng district.

Japanese Bulb Makers Organize

With the Government's formal denial handed to the Tokyo Electric Company of the latter's right for extension of its Japanese patent on gas-filled electric bulbs which expired August 31, and in view of a free and severe competition that is expected to ensue in the bulb market, the Japanese electric bulb manufacturing companies are now making fervent efforts to meet the situation.

Reports state that the manufacturers are planning to form an association in accordance with the Law of Industrial Association, in order to adopt measures for promoting the improvement of their products and the future expansion of the distributing market both within the country and abroad. The first step in this connection was taken at a conference at which representatives of the Teikoku Electric Company, the Tokyo Electric Light Bulb Company, the Ebisu Electric Bulb Company, Metro Electric Bulb Company and the Asahi Electric Bulb Company were present.

It is understood that the Tokyo Electric Company, which has lost its only weapon, the patent on the gas-filled bulb, is preparing to fight the situation out through means of price reduction, aiming evidently at imposing a destructive blow on the smaller Japanese electric bulb enterprises.

With its enormous capital of Y.42,000,000, of which Y.31,000,000 paid up, and its strong organization, together with the up-to-date manufacturing facilities, the Tokyo Electric Company will wage a successful war in the market, it is believed by many.

However, some of the traders point out that the Tokyo Electric Company may suffer from inconvenience in the expected market warfare, because of the existing over-extension of its plant facilities, only a part of which being reported to be in operation.

Regarding the conditions of the other Japanese bulb manufacturing enterprises, the Tokyo Electric Light Bulb Company is capitalized at Y.2,000,000, of which Y.500,000 paid up, the Taikoku Electric Company, at Y.1,000,000, of which Y.700,000 paid up, the Ebisu Electric Bulb Company at Y.1,300,000, of which Y.325,000 paid up, the Metro Electric Bulb Company at Y.400,000 all paid up and the Asahi Electric Bulb Company at Y.1,000,000, of which Y.250,000 paid up. There are several electric bulb manufacturing companies also in Osaka, but their capitalization is rather very small with no exception.

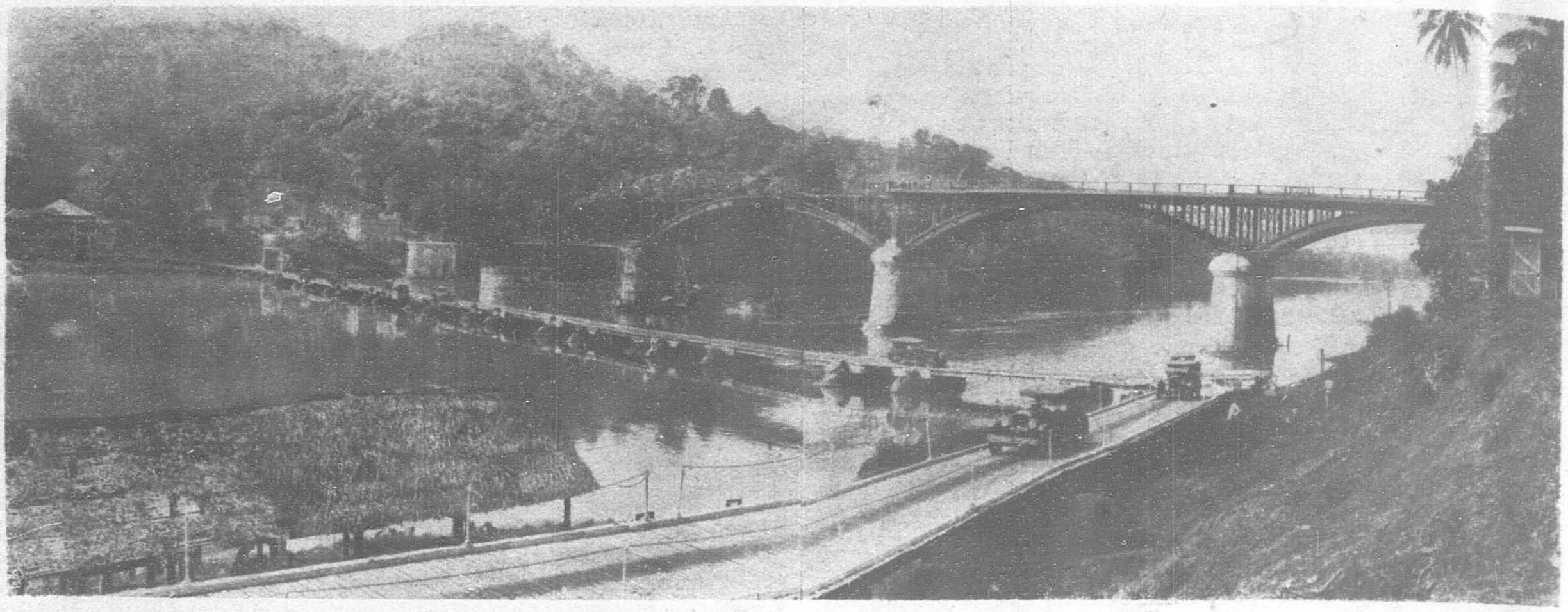
These smaller companies are able to utilize their productive facilities in full, and their capital turnover will be made effectively, which fact will enable them to reduce their production cost, while the production cost will possibly be higher in the case of the Tokyo Electric Company, it is held. Under the circumstances many doubt a success on the part of the Tokyo Electric Company in cornering the smaller manufacturers, in spite of its vast amount of capital and the equipment.

Another advantage for the smaller Japanese bulb manufacturing companies is the freedom they have enjoyed in the export field, while the Tokyo Electric Company is bound by the agreement between the company and the General Electric Company under which the former's marketing activity is limited to Japan and the Japanese territory.

According to trade statistics, the value of the Japanese electric bulbs exported during the year 1930 aggregated Y.5,400,000, the principal markets being the United States, British India, South Seas countries and Europe. Although this export is limited to only the miniature bulbs, the Japanese manufacturers are now endeavoring to expand their foreign trade to gas-filled bulbs.

It was recently revealed that some of the Japanese commercial houses in London have been negotiating with the smaller companies in connection with exports of the Japanese gas-filled bulbs to England.

Which side will win in the anticipated market warfare is beyond accurate reckoning, but at any rate a sharp reckoning, in the prices of electric bulbs is reasonably expected and the general consuming public will receive benefit from the situation.



The New Enggor Bridge as it appears in course of construction. In the foreground is the Pontoon Bridge which has been in use 39 years

The New Enggor Bridge

Engineer in Address Reviews History of Work of Spanning the Perak River

An interesting description of the new Enggor bridge over the Perak river, which is now nearing completion, was given in an address that was made at Ipoh recently by Mr. F. G. Coales, Senior Executive Engineer, Kuala Kangsar. Mr. Coales' address, as reported by *The Times of Malaya* was as follows :

At the point where the Enggor Bridge is being constructed, The Perak River has a normal channel 700 feet wide, the catchment area of the river above Enggor is computed to be 3,000 square miles. The river, like most tropical rivers, is liable to abnormal floods, and reliable records exist of two such floods, namely in 1897 and 1926. The dry weather flow of the Perak River is about 2,500 cusecs in round figures, whereas the computed discharge during the 1926 flood was 400,060 cusecs and the level rose about 36 feet. A cusec is a cubic foot of water per second ; very approximately two cusecs is a million gallons a day ; so the enormous volume of water that passed Enggor in 1926 can perhaps be realized.

Now, while water irrigation and hydro-electric engineers are very concerned with dry weather and minimum flows, the Bridge Engineer is mainly concerned with maximum of flood discharges because he must, when designing his bridge, provide a sufficient area of waterway to pass floods safely.

The Enggor Bridge provides a span between abutments of 928 feet, the springing level of the arches is about the level of the 1926 flood and the bridge has been designed to pass safely a flood of 25 per cent greater than the 1926 flood, so I think it can be said that the new bridge has a very ample margin of safety against floods.

Original Crossing by Ferry

Prior to 1892 the only means of crossing the stream was a ferry. Details of that ferry are not available, but I am sure, it was a source of annoyance to the travelling public of those days and the provision of a pontoon bridge must have been eagerly looked forward to by those who had occasion to travel.

The opening of the pontoon bridge in 1892 was the first step towards what to-day is a first class motor road linking Penang and Ipoh.

The pontoon bridge opened 39 years ago is the bridge over which you cross the river to-day, although at the time it was designed to last for 12 years, the design is of the U type—a type that allows a very considerable variation in the level of the river without interfering with traffic.

The bridge has carried the main road traffic with but few interruptions for 39 years ; in 1930 between the hours of 6 a.m. and 6 p.m. 79,962 motor-cars and 16,637 lorries crossed over it.

Pontoon Washed to Sea

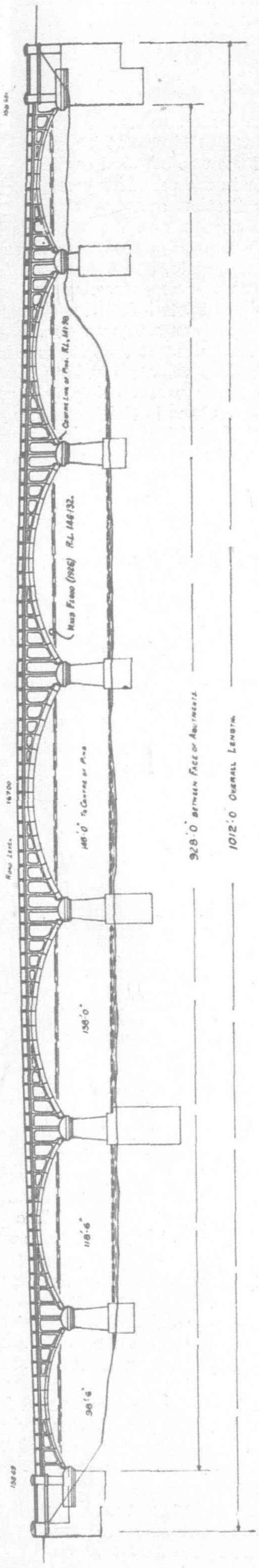
In the big flood of 1897 the Pontoon Bridge was wrecked, the pontoons broke away from their anchorage and started off down stream, being retrieved from the river bunds and islands right to the mouth of the Perak River. Legend has it that two went to sea and of the two, one was never seen again, the other being towed back from the Straits of Malacca.

In 1912 the question of building a permanent bridge across the Perak River was considered, and the relative merits of Blanja and Enggor were considered. Actually both sites were explored, but as the borings taken indicated that a better foundation might be constructed at Enggor and, of course, the rapid rise to the first ranks of the town of Ipoh indicated that the main trunk road must be the Ipoh-Kuala Kangsar route, rather than the Batu Gajah-Parit-Bruas road.

As a result of the investigations made during 1912 and 1913, an item for a bridge at Enggor was inserted in the 1914 estimates and the Crown Agents, who act as Consulting Engineers for Government of Perak, were asked to prepare a design. The outbreak of War in 1914 definitely stopped further action, and with the high prices ruling in the immediate post-war period, the subject was left until 1923. During that year that condition of the pontoons carrying the old bridge gave considerable concern to the engineers responsible for maintenance, and the fact that the old bridge was nearing the end of its useful life, together with the enormous growth of mechanical transport, made the provision of a new bridge an urgent need. A more detailed examination of the site was made in 1924 and early in 1925 plans and specifications were sent Home to the Crown Agents by the then Director of Public Works, Mr. C. V. A. Espeut, M.I.C.E., although these plans and specifications had been prepared under the direction of Col. J. P. Swettenham, M.I.C.E., who lately retired from the Public Works Department, of which, at the time, he was acting as Director—a post he succeeded to in the retirement of Mr. Espeut in 1927.

The Great Flood

By the end of 1925 two sketch designs were submitted by the Consulting Engineers, one for a girder bridge, and one for seven



arch spans. The latter design was accepted and a request was made that working drawings for the two bridges arch designs be proceeded with. The working drawings were completed by the end of 1926, when the 1925 flood, to which reference has already been made, occurred. As a result of that flood it was decided that the road level should be raised by six feet and the Consulting Engineers were asked to amend their plans accordingly. Thus, it was not until the middle of 1927 that the work was sufficiently advanced to invite tenders.

It was arranged to invite tenders in England for the fabrication of the steel works, and locally for the construction of the piers and abutments and for the erection of the steel works. Messrs. Head Wrighton of Stockton-on-Tees secured the fabrication contract and Messrs. Jas. Craig of Klang obtained the contract for the construction of the piers and abutments and for erecting the steel works. Messrs. Craigs' tender was accepted in April 1928, the contract time for the work being 3½ years.

Thirty Foot Carriage Way

The bridge is designed to provide a 30 feet wide carriage way. Footpaths are not provided, as it is thought pedestrian traffic will be small, the bridge being 4½ miles from Kuala Kangsar, but should pedestrian traffic exceed expectations it will be a simple matter to lay a concrete curb on the roadway and provide a six feet side walk. The loading provided for is a train consisting of one 15 ton tractor with three 12 ton trailers occupying a space of 72 feet, the remainder of the deck being assumed to carry a live load equivalent to 100 lbs. per square foot of deck area. Suitable allowance, has been made for impact. As point of interest the locomotive crane is being used for the construction weighs, when carrying its load of five tons, so the arches are carrying every day a single rolling load of 30 tons and my calculations indicate that a single load of 35 tons on two axles could safely cross the bridge.

In this connection it might be mentioned that army pattern armored cars weigh 7½ tons, so a fleet of such vehicles could cross the bridge without causing concern to anyone, and I think it may be said with confidence that the bridge will carry safely any likely developments in modern road transport.

Seven Spans

The bridge has seven arch spans, the center span being 160 feet between centers of piers, and 141 feet between the single centers, so that the actual clear span of the arch is 148 feet. The spans decrease from the center and are between centers of piers 150 feet, 130 feet and 104 feet.

Each span consists of four steel arch ribs hinged at the ends, the ribs being cross-braced ; the deck is carried above the ribs on vertical members, also cross-braced to give rigidity and to take care of wind pressure stresses. The ratio of rise to span is almost constant being 1 to 7 nearly for each span. The effect of this is to give the roadway a pleasing rise from the abutments to the center span. The total weight of steel work in the arches bracing the verticals of deck is 1,795 tons, and there are approximately 20,000 field rivets in each span.

The arches are carried on six piers and two abutments, all of mass concrete, the extressed portions being faced with coursed pre-cast concrete blocks with a rock face. The two abutments are carried down to a suitable foundation in open excavation, and the design provides for a maximum loading on the foundation of five tons per square foot.

The piers are carried on mass concrete caissons provided with steel curbs or cutting edges, the maximum stress under the most severe condition of live loading being 10½ tons. A caisson is a box with neither bottom nor top, and it is designed to sink under its own weight, while the material is excavated from inside it, as the walls are bulit up. Each caisson, except that for pier 2, is 45 feet long by 20 feet wide and is divided into three compartments by two division walls.

The method of sinking employed has been that known as the open dredging method, the material being grabbed out from inside until rock was reached. When no further grabbing could be carried out, divers were sent down to drill under water holes by explosives, jack hammers worked by petrol-driven air compressors being used for this work. The drivers shot out some of the rocks until the cutting edge was either on or very nearly onto the rock. A concrete wall was then built by the drivers sealing the cutting edge to the rock. This enabled the caisson to be de-watered and inspected in the dry. Any unsatisfactory or decomposed rock was then removed and the bottom cleaned up and sealed with a concrete plug. After the seal plug was placed the caisson was hearted with concrete up to the level at which the pre-cast block work began.

Some Difficult Obstacles

This method of founding has been explored for the five river piers successfully and as you cross the pontoon bridge you can see these piers completed and carrying their spans. Pier No. 2 presented a difficulty for the detailed check bores located a limestone pinnacle, whose top was at R. L. 60, about 50 feet below water level, but unfortunately this pinnacle only occupied the area of the down stream compartment of the caisson, the bed rock in the upstream compartment and over 50

per cent of the center compartment being at R. L. 42 or from 18 to 20 feet lower.

The problem of satisfactorily founding this caisson was one of considerable difficulty and many schemes were considered. Finally it was decided to adopt the scheme first proposed by the Resident Engineer, Mr. Clarkson that being to found the caisson at R. L. 60 and sink cylinders within this caisson to the bed rock inside the center and upstream compartments and in order to provide room for this operation and also to reduce the unit stresses, the caisson was widened by six feet making the caisson for pier 2, 48 feet by 26 feet.

The work is now in hand, but unfortunately the unforeseen difficulties will delay the completion date for the extra work entailed is considerable and necessarily slow. There is no doubt but for this the bridge would have been ready earlier.

The original bores did not indicate that there would be any special difficulty over the foundation for this pier.

An Enormous Tree Trunk

Pier two has been unlucky for shortly after sinking began, the cutting edge came onto a buried merbau tree five feet in diameter lying diagonally across the caisson, this tree had to be cut in four places and in addition a two feet diameter branch and a similar sized root fouled the cutting edge and also had to be cut. This work was carried out from five to 10 feet below the bed level of the river which at this point is 10 feet deep; all of you know that merbau is a very hard timber and it was a work of considerable magnitude to clear this log, which now lies on the right of the road from Enggor to Kuala Kangsar, just before you go under span No. 7 and I hope the text time you travel by road you will look at it, for to see it will give you a good idea of the time and labor which were involved in getting it out.

The strata may be of interest as many of you are engaged in mining or connected with it. The bed rock is granite on the left bank under the abutment and Pier No. 1, the first river pier.

A Limestone Pinnacle Under the River

Then we have Pier 2 and Pier 3 in limestone, Piers 4, 5 and 6 and the right abutment have granite again as the rock, thus there is a somewhat unexpected intrusion of limestone which is, I believe, of considerable interest to the geologists. The strata overlying the bed rock is sound and gravel in every foundation except that for pier 2 in the case of pier 2 between it and the bed rock is a clay interspersed with bands of limestone varying in thickness from one foot to three feet.

The 30 feet carriage way will be Tarmaladan and will be protected by ornamental cast-iron parapets. It has been decided to paint the bridge green, a color which seems to harmonize best with the surrounding jungle scenery, the site is of great natural beauty, and we hope that the bridge when completed will be a pleasing addition to the landscape for it would be a thousand pities to neglect the aesthetic side of the problem.

The bridge necessitated the construction of ¾ mile of new road in the two bridge approaches and the earthwork for the approaches was carried out in 1928 by Messrs. Eliatamby and Ten Chin, a well-known and long-established firm of contractors in Taiping. The approaches provide a 20 feet metalled surface, which widens out to 30 feet as the approach road binds round on to the new bridge. The bunds have been very carefully super-elevated and should allow traffic to travel round them at 40 miles per hour without any wheel skid. The metalling of the approaches and the final surface of tar graniting has been carried out by my department as it is the usual custom to do the metalling of roads by direct labor.

The labor force employed on this work excluding the road construction has been between 150 and 200 the bulk of them being Chinese, the divers are Chinese and as many as 12 divers have been employed. The labor force is housed in temporary lines on the left bank of the river, the camp and works being supplied with water from an intake on the hill above the river. The water is taken across to the right bank by a galvanized iron pipe laid along the pontoon bridge. The bridge side had a bad malaria reputation and the first concern was to locate and deal with breeding places or potential breeding places. With the advice and assistance of the Health Branch of the Medical Department, an organized oiling and drainage gang were employed and all dangerous spots were either drained or oiled.

Tribute to Health Department

This work has been continuous and we are assisted by periodical visits from the local Health Officer. It is a matter for congratulation that in the case of the two big civil engineering works carried out on the Perak River in the past four years, I refer of course to the Chenderoh Power Station and the Enggor Bridge, the co-operation between the doctors and the engineers has resulted in big labor forces being employed in malarious areas with an almost negligible malaria sickness rate, and that in the future this close co-operation will be a matter of course, when large labor forces are gathered together in districts infected with malaria.

All the stone used for concrete was quarried 1½ miles from the bridge from a P.W.D. quarry at the 26th mile in the Ipoh road on the left side of the river when a crushing plant was installed by Messrs. Jas. Craig, the transport being by Ford motor lorries, since a Ford lorry is the only unit which can carry its load across the pontoon bridge without infringing the load restriction limit.

The sand was obtained from the Perak River, being collected by Chinese and brought to the banks by tonkangs. The cement was transported to the bridge site from Kuala Kangsar railway station, as were all the other materials, the Kurai station although nearer the site has the disadvantage of being on the left bank of the river and our yards, workshops, etc., are in the Kuala Kangsar side. All the concrete made has been tested by crushing strength as a matter of routine, we were able, thanks to the courtesy of Mr. T. Culin, the Resident Engineer at Chenderoh, to use his laboratory for crushing in cubes and when that was closed on the completion of the civil engineering contract, small 120 ton testing machine made by Messrs. Jas. Craig to a design by Mr. Clarkson was obtained and is in use to-day.

Although perhaps rather a technical detail it may interest some of you to know that the average crushing strength of the concrete obtained after 28 days is as follows:—

				lb. sq. inch.
1 cement	3	coarse aggregate	.. .. ..	5,250
1 ,,	3½	,, ,,	.. .. ..	4,100
1 ,,	5	,, ,,	.. .. ..	3,300
1 ,,	6	,, ,,	.. .. ..	2,900

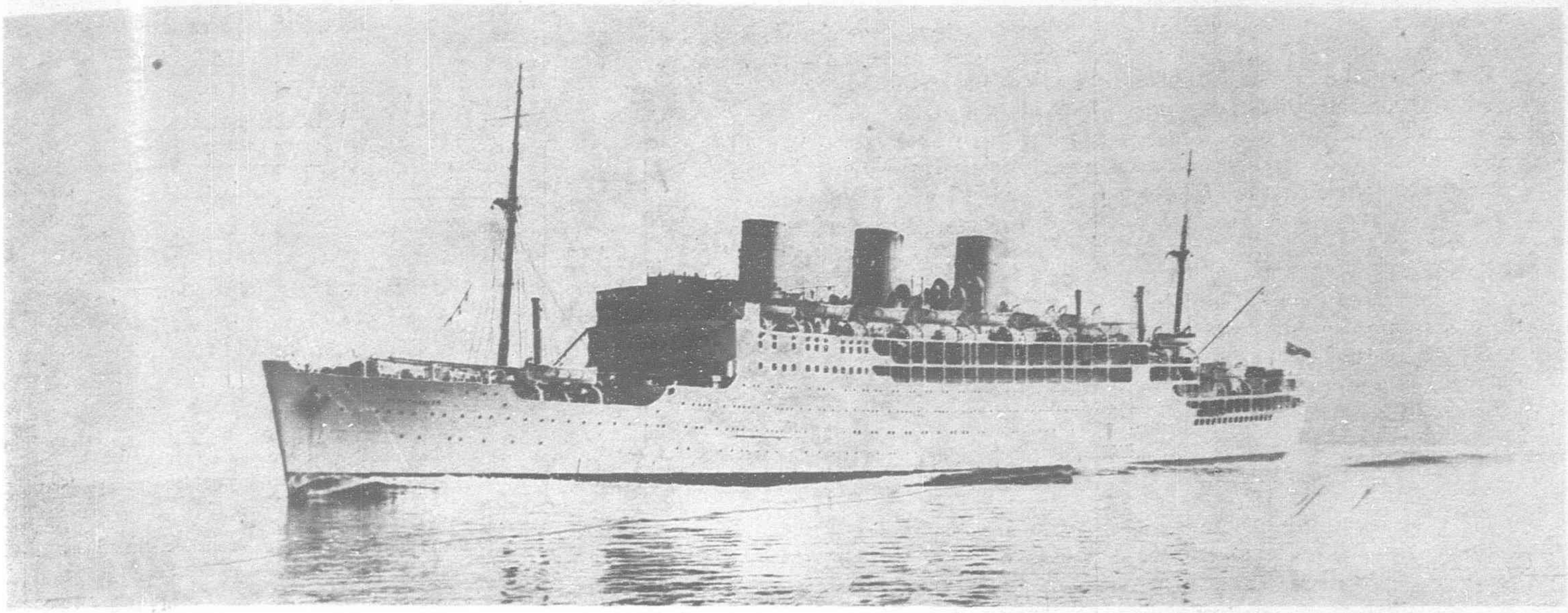
The contractors, Messrs. Jas. Craig have been represented by Mr. Ingles, M.I.C.E., until the spring of 1929 and since that date by Mr. Evans, B.Sc., A.M.I.C.E., as agents, while Mr. Clarkson, B.C.E. of the Public Works Department has been the Resident Engineer since the contract commenced.

Soviet Oil Industry for 1932-1933

(Continued from page 126).

from the atmospheric stage is delivered to the two vacuum stages which operate in parallel. Under normal operation products of the vacuum stages are heavy gas oil, four lubricating oils including overhead cylinder stock and flux residuum. The principal reason for building the two stage unit in three sections was the difficulty expected in shipping large tower sections together with the expense involved in erection of large equipment with unskilled labor and without special equipment. Another factor in favor of the twin vacuum stages was the increased flexibility to be obtained inasmuch as one stage could operate to one set of specifications and the other to a different set of specifications to meet the most exacting market demands.

All six of the Russian units were purchased for the oil trusts by Amtorg Trading Corp., the American purchasing agents of the Soviet. The units were erected with local labor supervised by Foster Wheeler engineers. The erection work proceeded without undue delay and each unit went on stream without any trouble. No changes were required in the field during erection and to obtain guaranteed results throughout only one tower required changes, and these were of minor nature.



The New P. & O. Turbo-Electric Liner "Strathnaver"

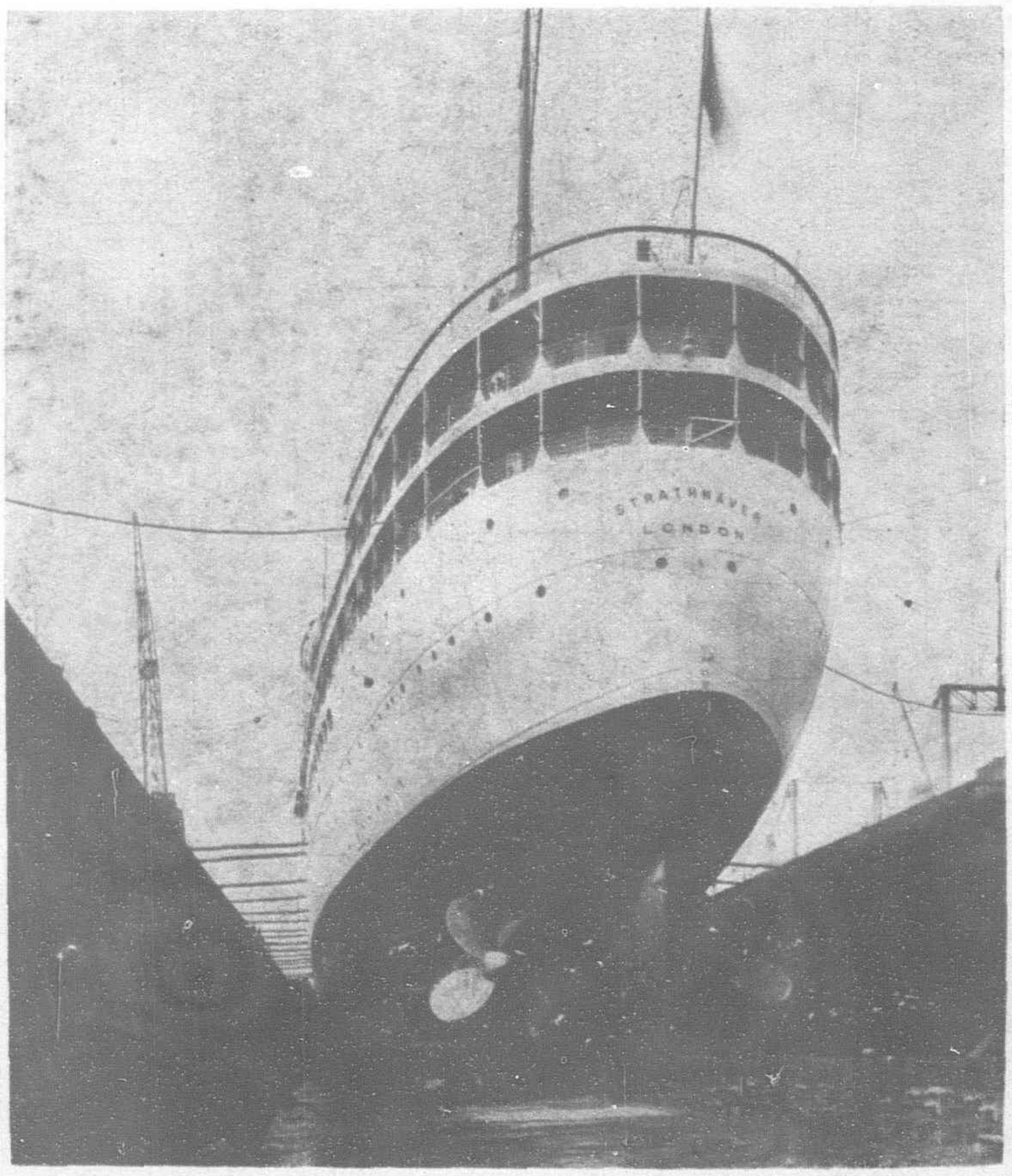
Turbo-Electric Liner "Strathnaver"

The First of Two New P. & O. Liners with Turbo-Electric Propulsion for the Passenger, Mail and Cargo Service between London and Australia via Bombay. Built by Vickers-Armstrongs Limited, Barrow-in-Furness. Electric Propulsion Equipment by the British Thomson-Houston Co., Ltd., Rugby

No two vessels exceed in importance, in regard to their general design or mechanical details, the two liners *Strathnaver* and *Strathaird*, which the Peninsular & Oriental Steam Navigation Company are putting on their passenger and mail service between London, Bombay and Australian ports.

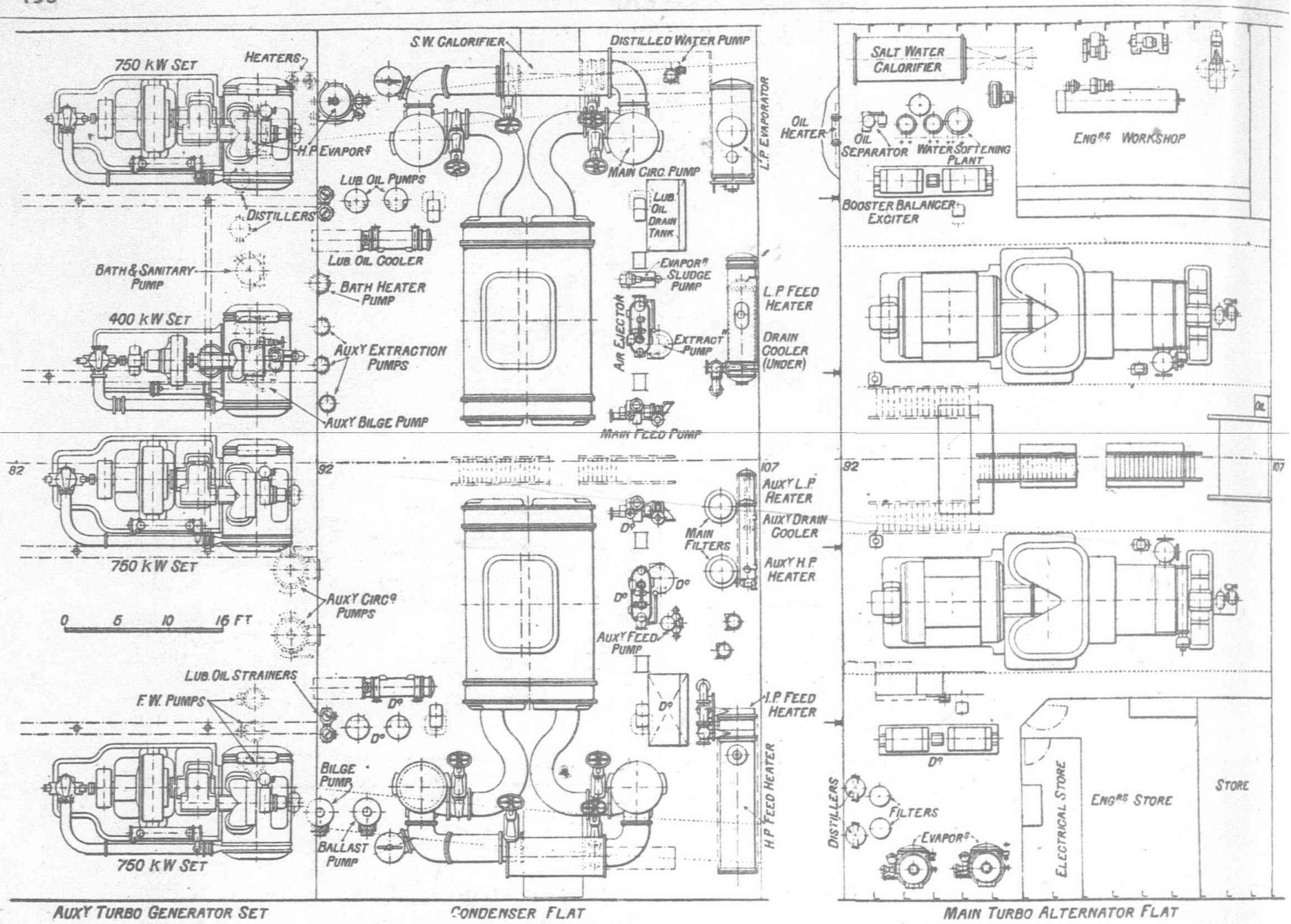
They mark a further stage in the provision of high-class tonnage, the construction of which has been vigorously pursued by the company during Lord Inchcape's régime. Through the progressive developments revealed in the programmes which brought successively into being types like the *Naldera*, *Maloja*, *Ranchi* and *Viceroy of India*, passengers to the East now have the choice of a wide range of tonnage which has reached a standard of comfort and convenience unexcelled on any other trade route.

The later vessels, as a result of very close attention to the requirements of passengers and the embodiment of their wishes in naval architectural form by Mr. R. W. Rugg, the company's naval architect, have reached a stage beyond which, particularly in the two new ships, it seems almost impossible to go. The services call for a series of exacting and conflicting conditions. The ships must be sufficiently warm and comfortable to face the rigors of climatic changes in cold latitudes, and they must also be so freely ventilated that passengers experience the minimum discomfort in tropical regions. The decision to give these vessels all-white hulls is an example of how attention to detail can secure part of this aim effectively and economically. Quite apart from the remarkably handsome appearance and impressive outline of these two ships, with their white hulls and three yellow funnels, it has been found that the color reduces the temperature inside the hull by about 4° F., compared with black hulls, so that not only do the passengers have the benefit in increased comfort, but a corresponding proportion of work is taken from the hotel load of the machinery.



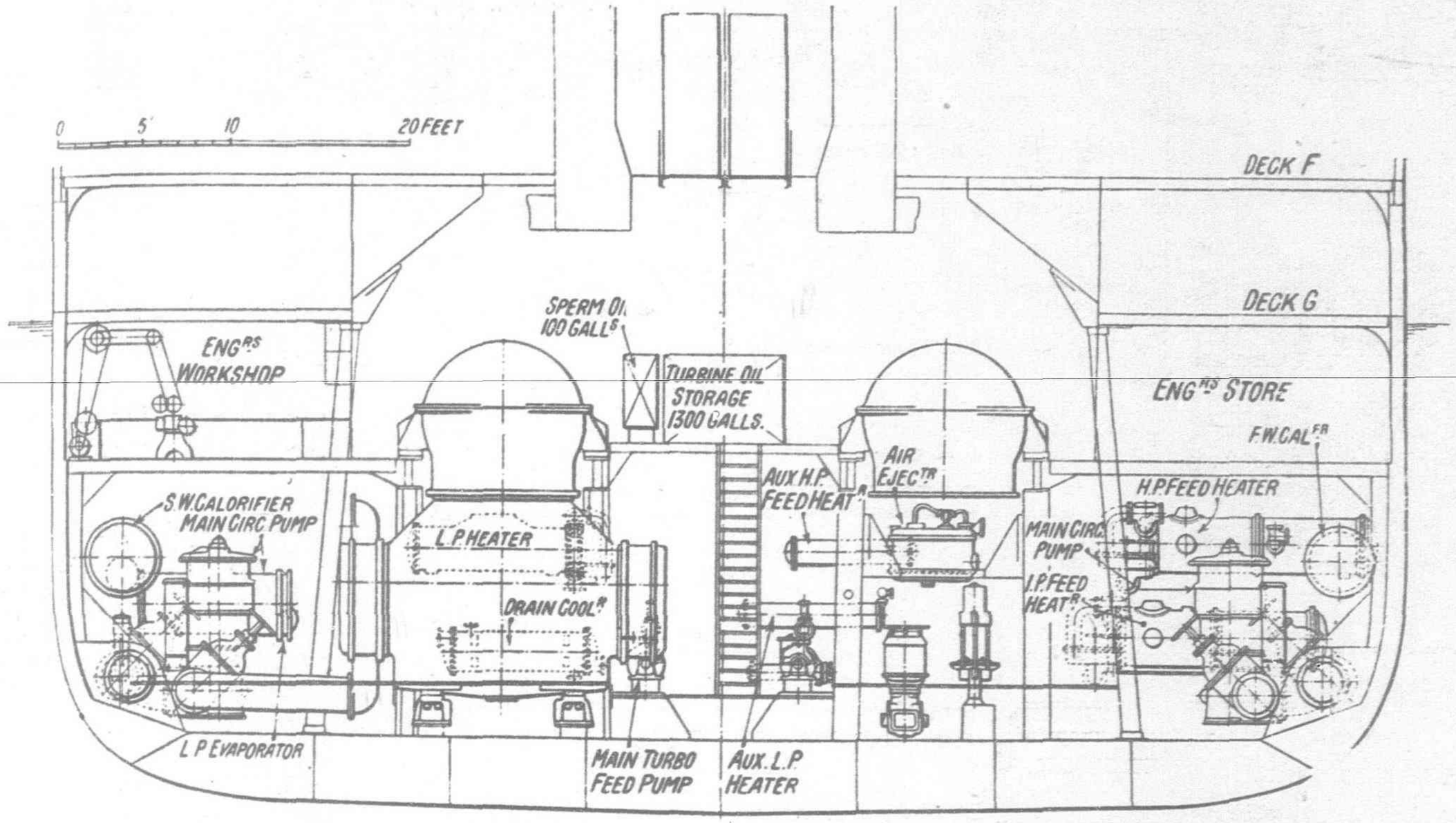
The "Strathnaver" in Dry Dock

The *Strathnaver* and *Strathaird* are not the first large turbo-electric liners to be built in England. That distinction, held by the Peninsular & Oriental Steam Navigation Company through the enterprise of their superintending engineer, Mr. R. T. Clarke, belongs to the earlier vessel, the *Viceroy of India*, built at Linthouse in 1929. The success and popularity of this vessel and the convenience of the machinery for maintaining, economically, the wide variations of speed which are features of the long run, led to the adoption of turbo-electric drive in the two new vessels, and once more the contract for the machinery went to the British Thomson-Houston Company, a tribute to the work they did in the *Viceroy of India* and a triumph for Mr. W. J. Belsey, whose advocacy of turbo-electric drive is so well known. From a passenger point of view, turbo-electric drive is unquestionably



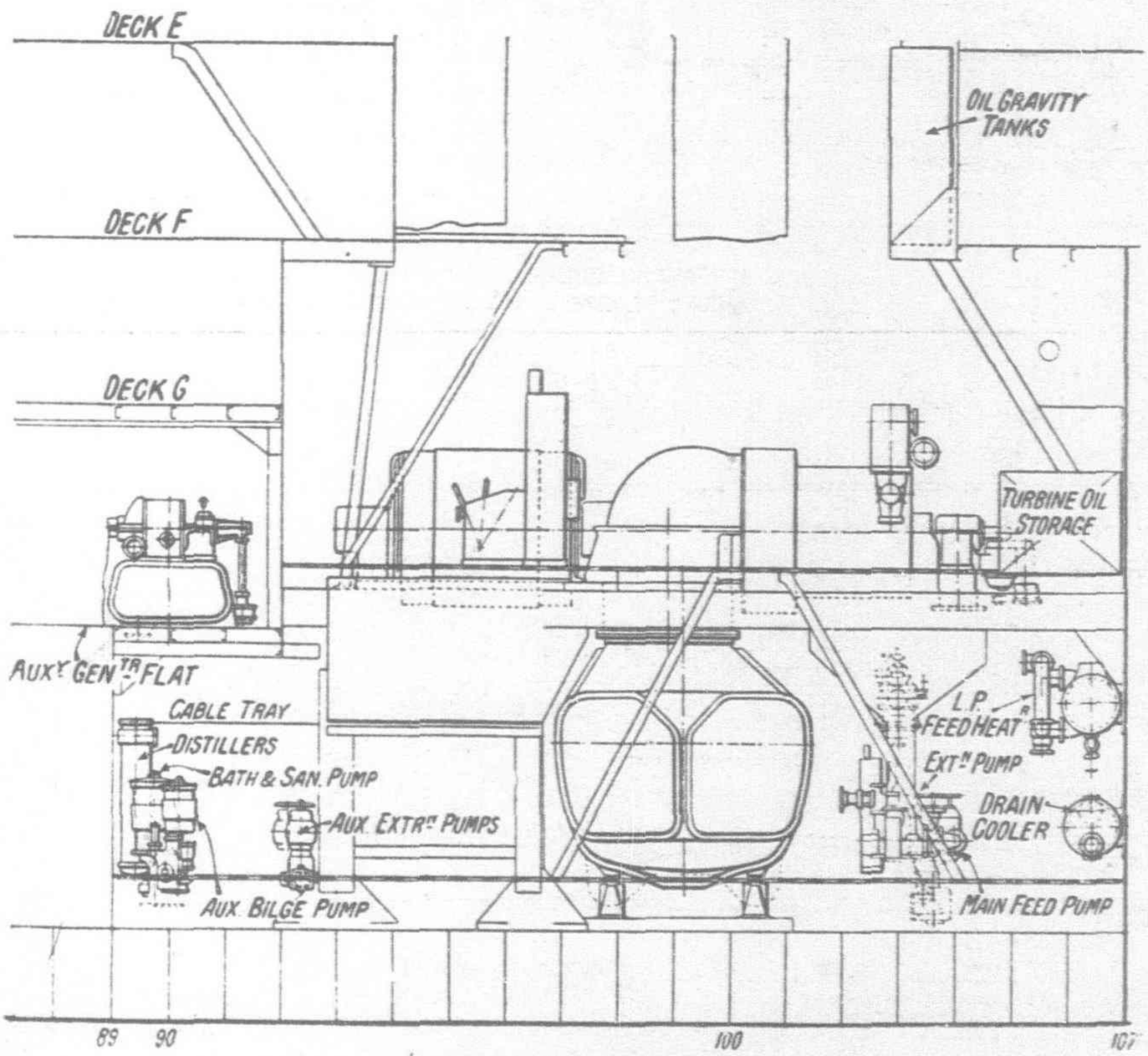
Engine Room Arrangement

Diagrammatic Layout of Weir's Closed-Feed System in the "Strathnaver."



SECTION AT FR. 98 LOOKING FORWARD.

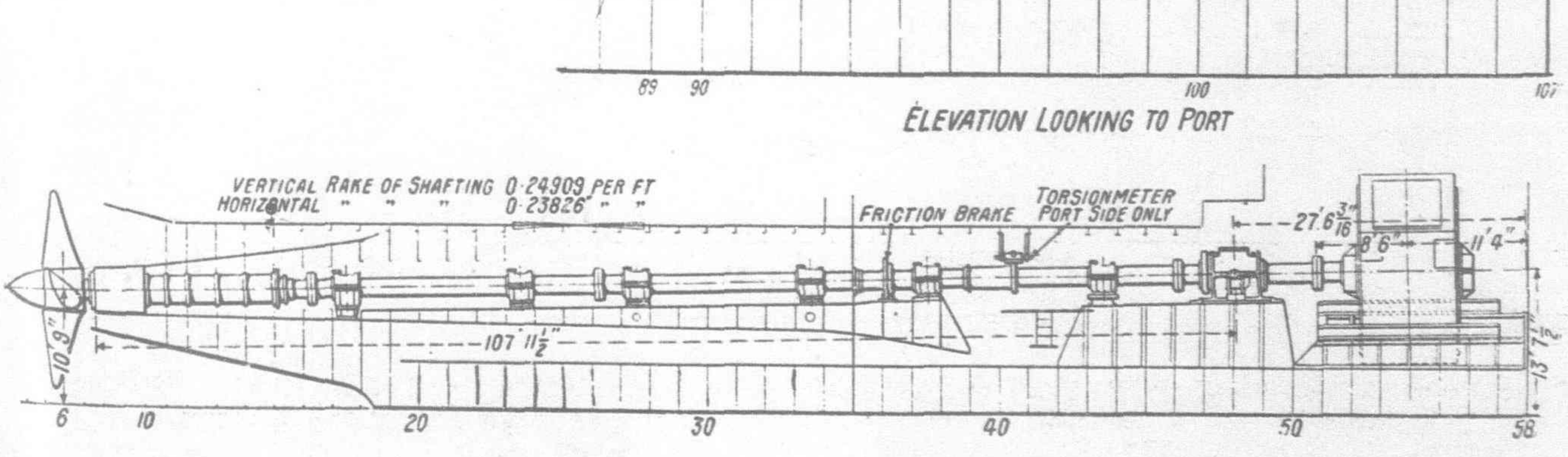
SECTION AT FR. 99 LOOKING FORWARD.



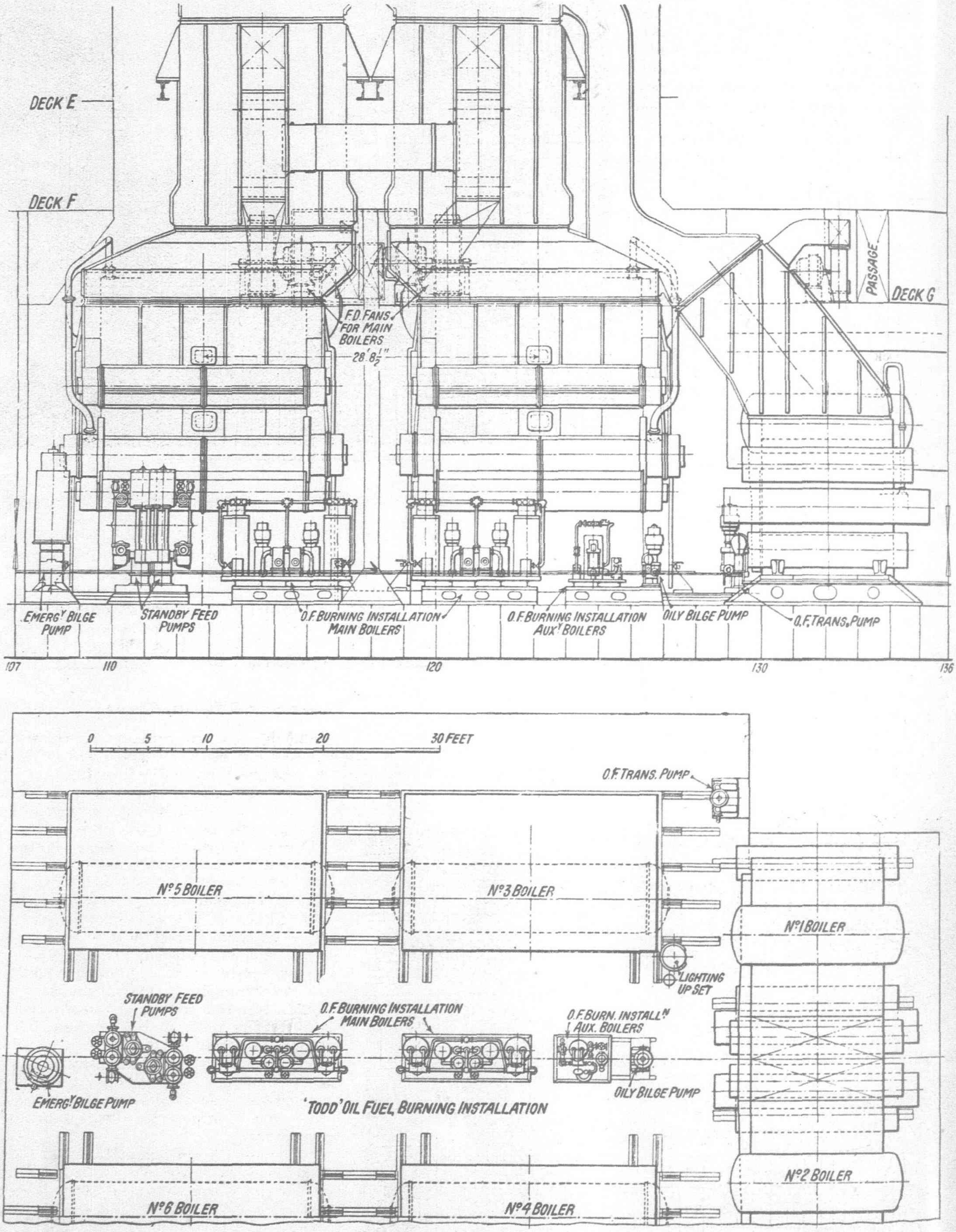
Above: Section through the Engine Room of the "Strathnaver," showing the Main Turbines mounted directly over the Condensers.

Right: Elevation of Engine Room, showing position of Main and Auxiliary Turbo-Generator Flats.

Below: Elevation showing One of the Main Propulsion Motors with its Shaft and Propeller



ELEVATION LOOKING TO PORT



Boiler Room of the "Strathnaver." There are four Main Boilers and two Auxiliary Boilers, all of the Yarrow type, having a Blow-off Pressure of 425 lbs. per sq. in., the steam being superheated to 725 degrees F.

the quietest and most comfortable, and those who have travelled in the *Viceroy of India* will readily subscribe to an observation which was made when the *Strathnaver*, on the way round from the Clyde to Tilbury, was doing 22 knots—that she was "as still and silent as a ship under sail."

The contract for these two vessels was placed with Vickers-Armstrongs Limited, and they were laid down in the Naval Construction Works, Barrow-in-Furness. The *Strathnaver* was launched in February, 1931, and sailed from Tilbury on her maiden voyage on October 2. The *Strathaird* was launched on July 18 and went into service in February.

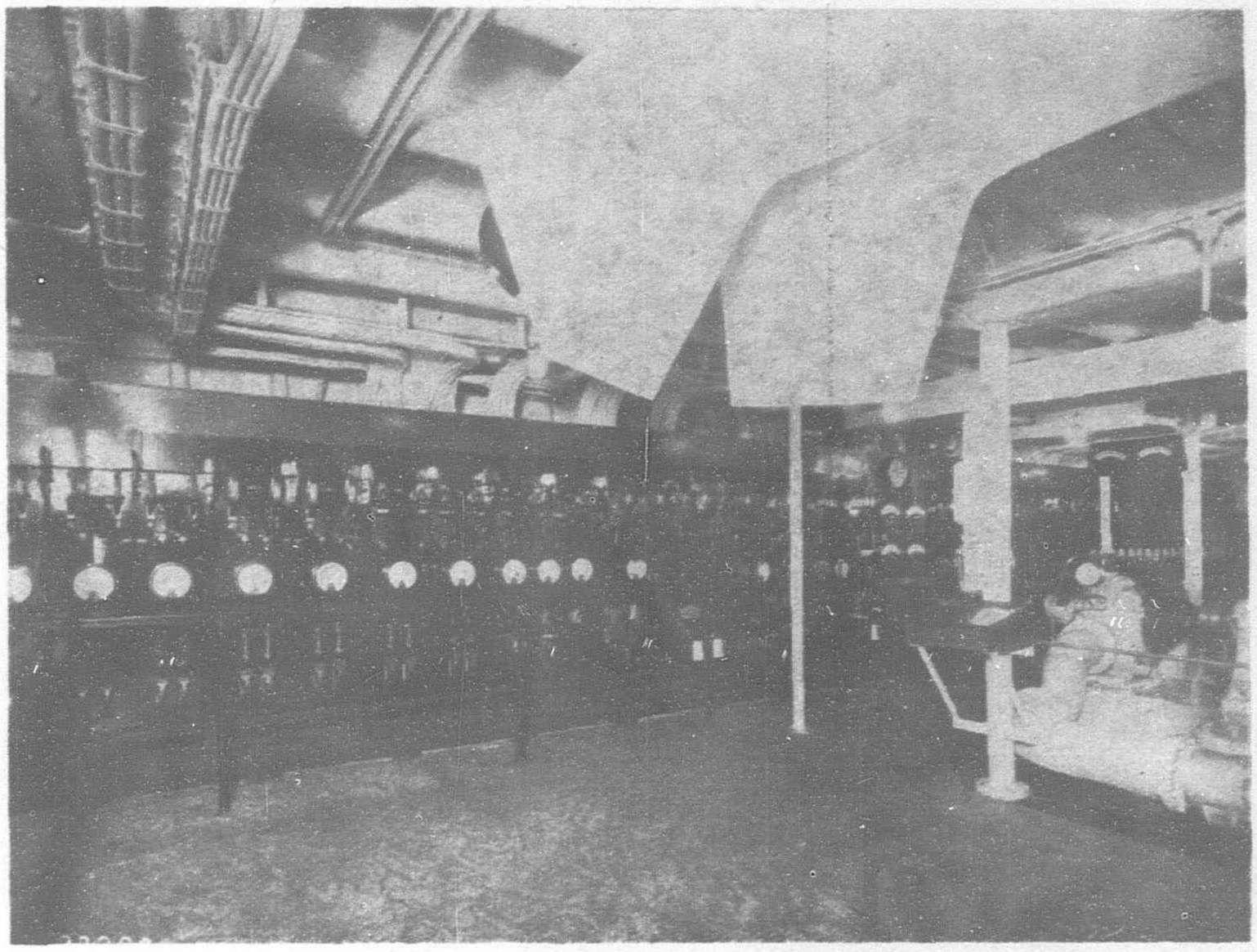
The following are the principal particulars of this vessel :—

Length, overall	664-ft.
Length, b.p.	630-ft.
Breadth, moulded	80-ft.
Depth, to E deck	46-ft. 6-in.
" D deck	54-ft. 9-in.
" C deck	63-ft.
" B deck	71-ft. 3-in.
" A deck	81-ft. 9-in.
Load, displacement (about) ...	27,556 tons
Load, d.w. (about)	9,973 tons
Draught, loaded	29-ft. 2-in.
Gross tonnage	22,547 tons
Net tonnage	13,620 tons
Speed	22 knots

Passengers and crew :—

First saloon passengers ...	498
Tourist class passengers ...	670
Officers, engineers and crew ...	487
Total complement ...	1,655

The *Strathnaver* has been built in accordance with the requirements of Lloyd's class 100 A.1 with freeboard, and the latest requirements of the Board of Trade for a passenger ship. She has a straight stem raked forward, cruiser stern, two steel masts, and three stream-lined funnels. These are combined with an all-white color scheme presenting in outline a very graceful appearance. The stem is of the round plate type above the load water line and of the usual bar type below. It is well raked forward and has a watertight door about 33-ft. above the load line for the Suez Canal searchlight which will facilitate navigation in the Canal. The



D.C. Switch-board in the "Strathnaver"

Steel Company of Scotland supplied all the mild and special steel plates.

The hull is subdivided by 12 watertight bulkheads which extend up to F deck. Additional subdivision is provided by longitudinal wing fuel tanks and fresh water tanks in way of the engine and boiler rooms.

The subdivision is arranged to conform with the latest requirements of the Board of Trade and the International Convention for the Safety of Life at Sea. The cellular double bottom is arranged for oil fuel, fresh water, boiler water and water ballast.

Passenger Accommodation

There are in all nine decks in the depth, the upper six having open-air promenade spaces for the use of passengers. The decks, commencing with the boat deck, are lettered A, B, C, D, E, F, G and H, of these E, F and G are continuous from stem to stern.

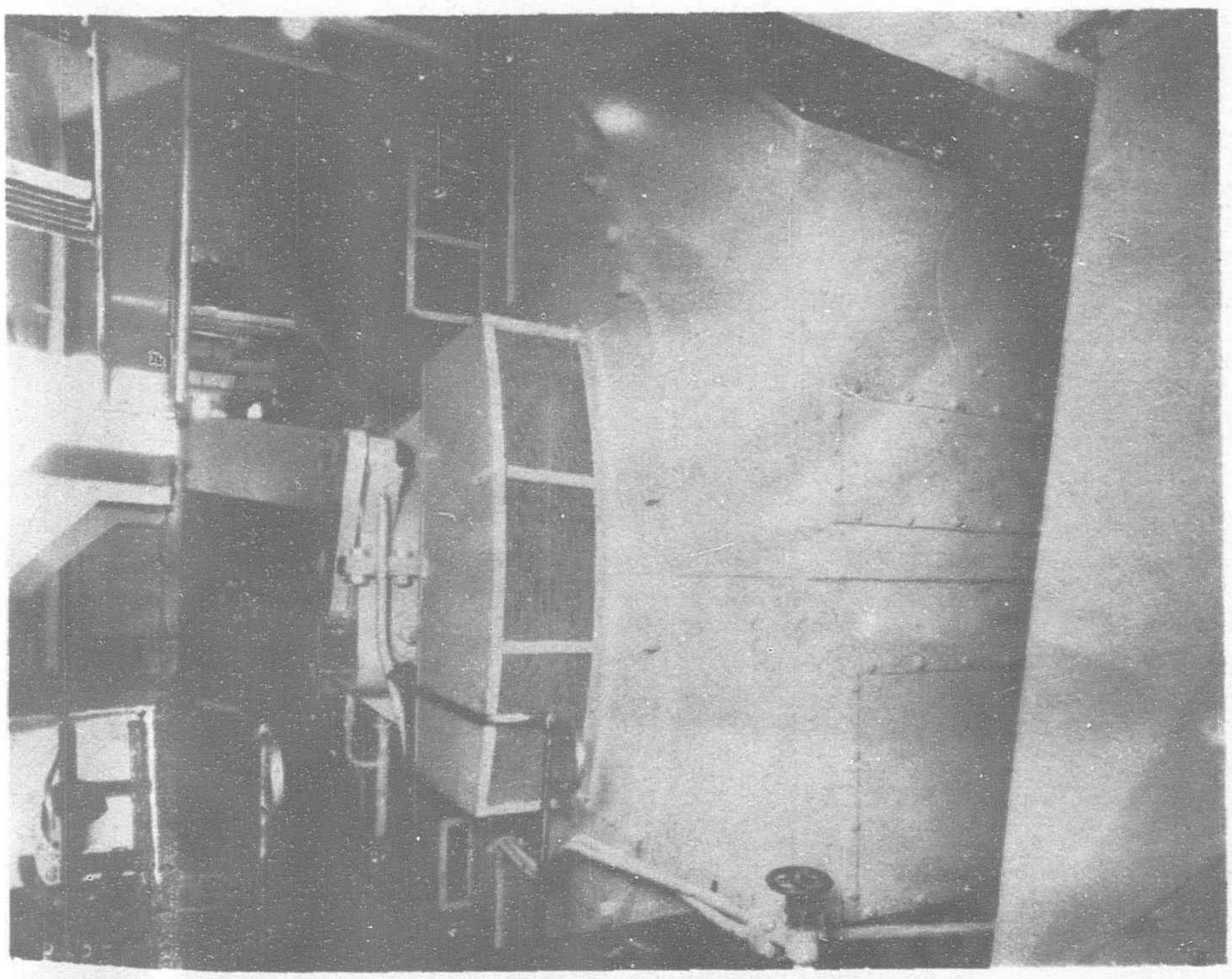
Deck A has been specially arranged for clear space for deck games and access to the ship's side for the full length of the deck, together with a completely equipped gymnasium.

B deck is arranged for all the main first saloon public rooms opening on a spacious promenade deck, as follows:—First saloon lounge with a verandah lounge outside, smoking room, reading and writing room, dancing space with portable screens, corridor lounge, verandah café with American bar, children's nursery with a specially-arranged playing deck space around the nursery. The forward ends and sides of B and C decks are closed in and fitted with vertical saloon sliding windows of Carron Company's latest type, the cover plate of which is so arranged that the top portion is easily removed for replacement of broken glass without disturbing operating gear or woodwork.

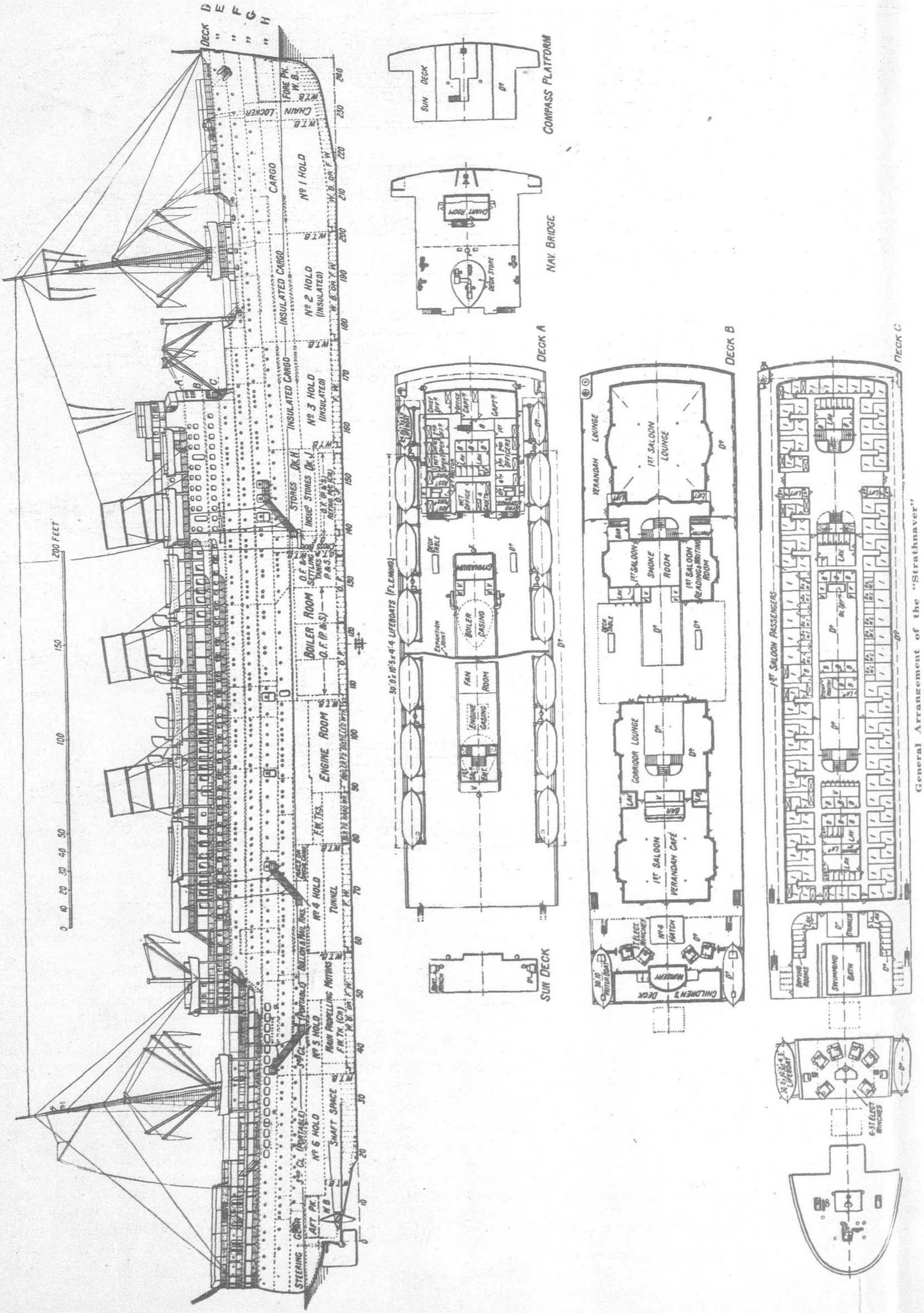
A number of side-lights of special type have been supplied by J. & J. Woods Limited, Rainhill.

The first saloon passengers are accommodated on C, D, E and F decks. The state rooms on C deck are all arranged for one berth and those on D, E and F decks for one and two berths.

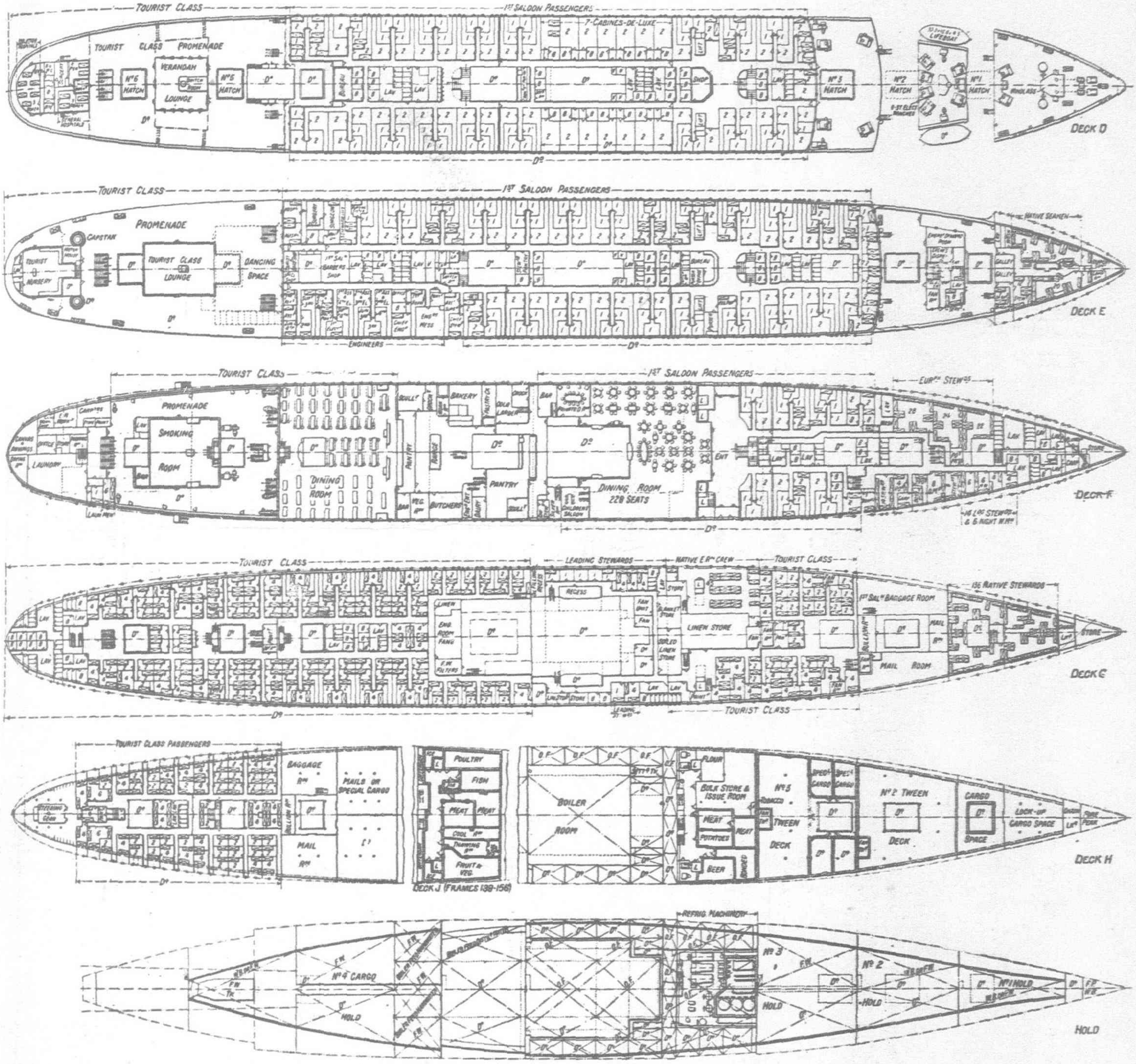
On C deck are twelve special single-berth state rooms each with a private bath-room attached and on D deck are fourteen two-berth *de luxe* state rooms having walls panelled in various polished hard woods and decorated in



Port Propeller Motor, Forward End



General Arrangement of the "Strathnaver"



Arrangement of Decks on the "Strathnaver"

different colors to suit. Each *de luxe* state room also has a private bath-room attached. The forward state room on each side of the ship has been arranged so that it can be converted into a sitting room to form a suite of rooms in conjunction with the *de luxe* state room adjoining.

The first saloon dining-room and tourist class dining-saloon are situated on F deck, being separated by the kitchens and pantries which have been specially arranged to ensure efficient service being maintained.

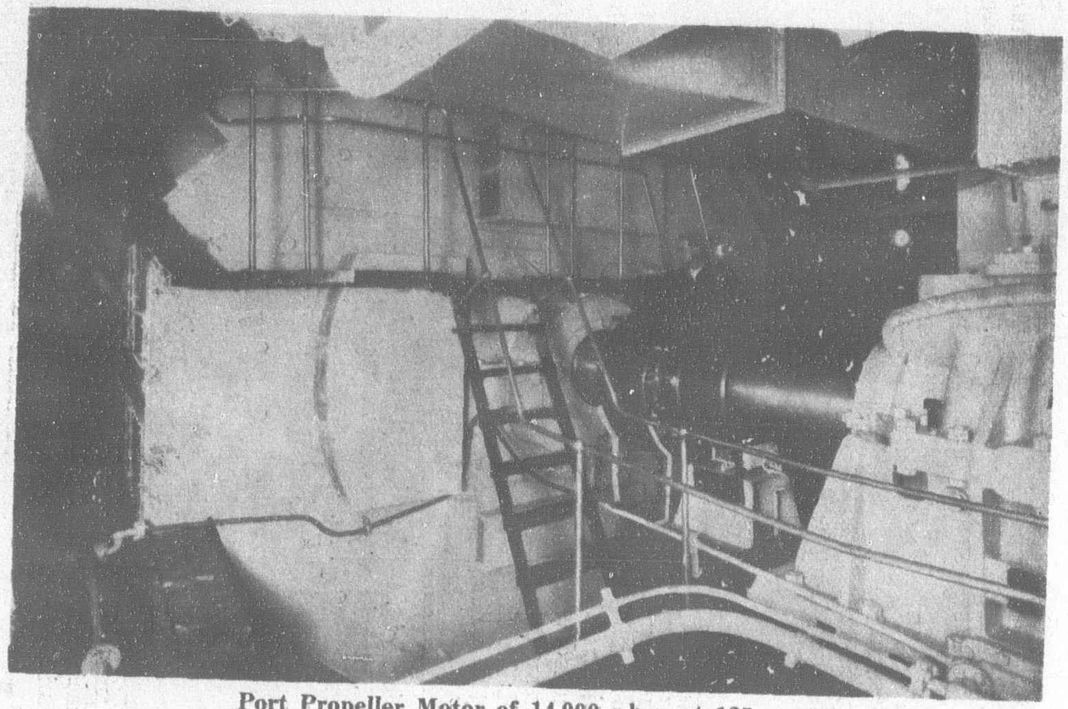
Two passenger lifts have been installed by the Medway Lift Co. Ltd. One on each side of the vessel serves each deck from the first saloon dining-room entrance on F deck to the first saloon lounge and other public rooms on B deck.

The decoration of the public rooms and stairways is one of the features of the vessel, and has been carried out by Waring & Gillow Limited.

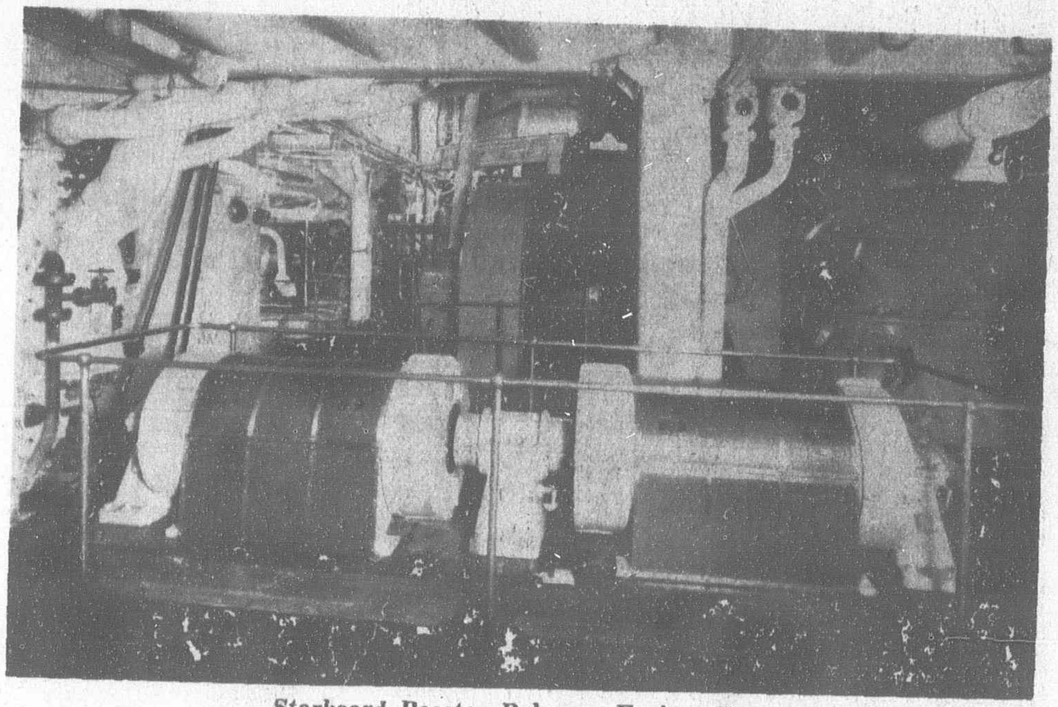
The first saloon lounge is a finely proportioned room, the decoration being Italian in conception, the walls being panelled with a walnut dado with cream sycamore filling above, surmounted by a richly decorated frieze in blue and ivory coloring. Fine columns and pilasters in blue lacquer with corinthian capitals in antique silver support the main ceiling beams, the ceiling being panelled with enriched mouldings painted to a soft shade of ivory. The main lighting of the room is obtained from a handsome bronze grille forming a band of light behind glass panels in the center portion of the ceiling supplemented by handsome bronze electric ceiling fittings and carved torchere brackets on the walls. The floor, with an area of 2,750 sq. ft., is covered with oak parquetry of special design $\frac{7}{8}$-in. thick, with all panels feathered and grooved. It has a 6-in. margin of oak and two walnut lines inset. The flooring was supplied by A. M. Macdougall & Son, Glasgow. There are hand-made carpets with plain blue centers and richly colored borders.

A New Type Verandah Cafe

The after section of the public rooms on "B" deck, usually occupied by the smoking room, is styled the verandah café. The use of the term verandah café on board ship has, hitherto, implied a small recess leading from the smoking room aft, decorated and furnished in a variety of styles but providing, in the main, a semi-enclosed shelter looking over the stern of the ship. In the case of the *Strathnaver*, however, the verandah café is a large

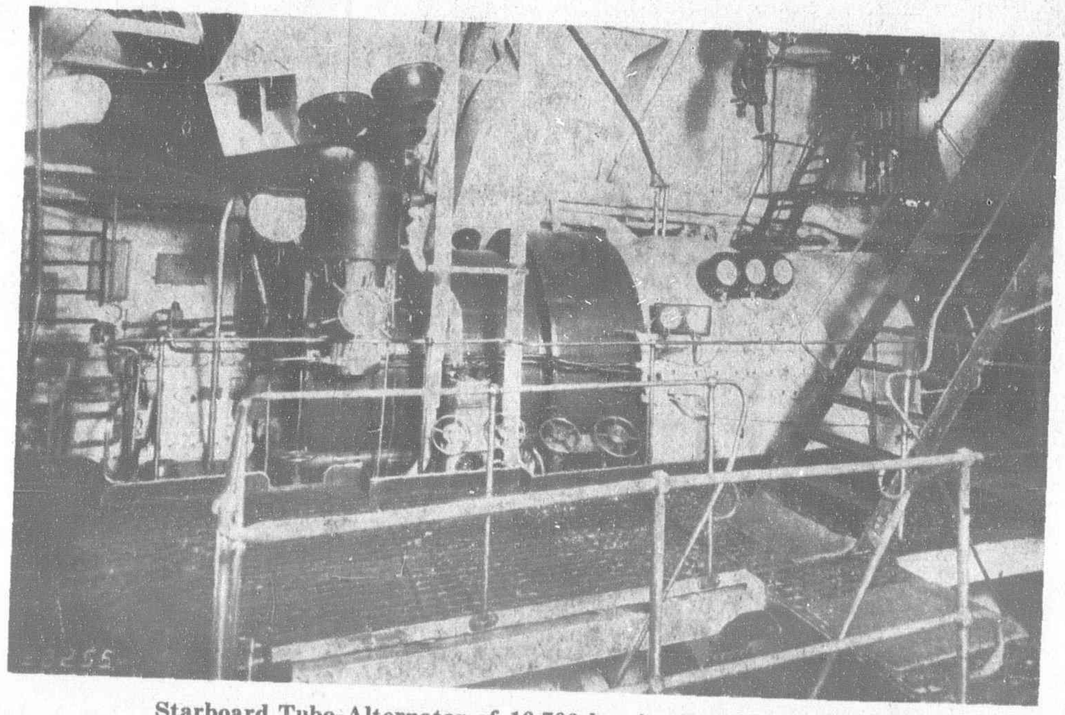


Port Propeller Motor of 14,000 s.h.p. at 125 r.p.m.



Starboard Booster Balancer Exciter Set

One 400-k.w. and Two 750 k.w. Auxiliary Direct-Current Turbo Generators



Starboard Tubo-Alternator of 10,700 kw. in the "Strathnaver"

apartment—larger, in fact, than is allotted to most smoking rooms—and would be regarded, indeed, by many who are familiar with modern liners as a smoking room. The smoking room on this ship is a smaller apartment farther forward on the port side and adjacent to the writing room.

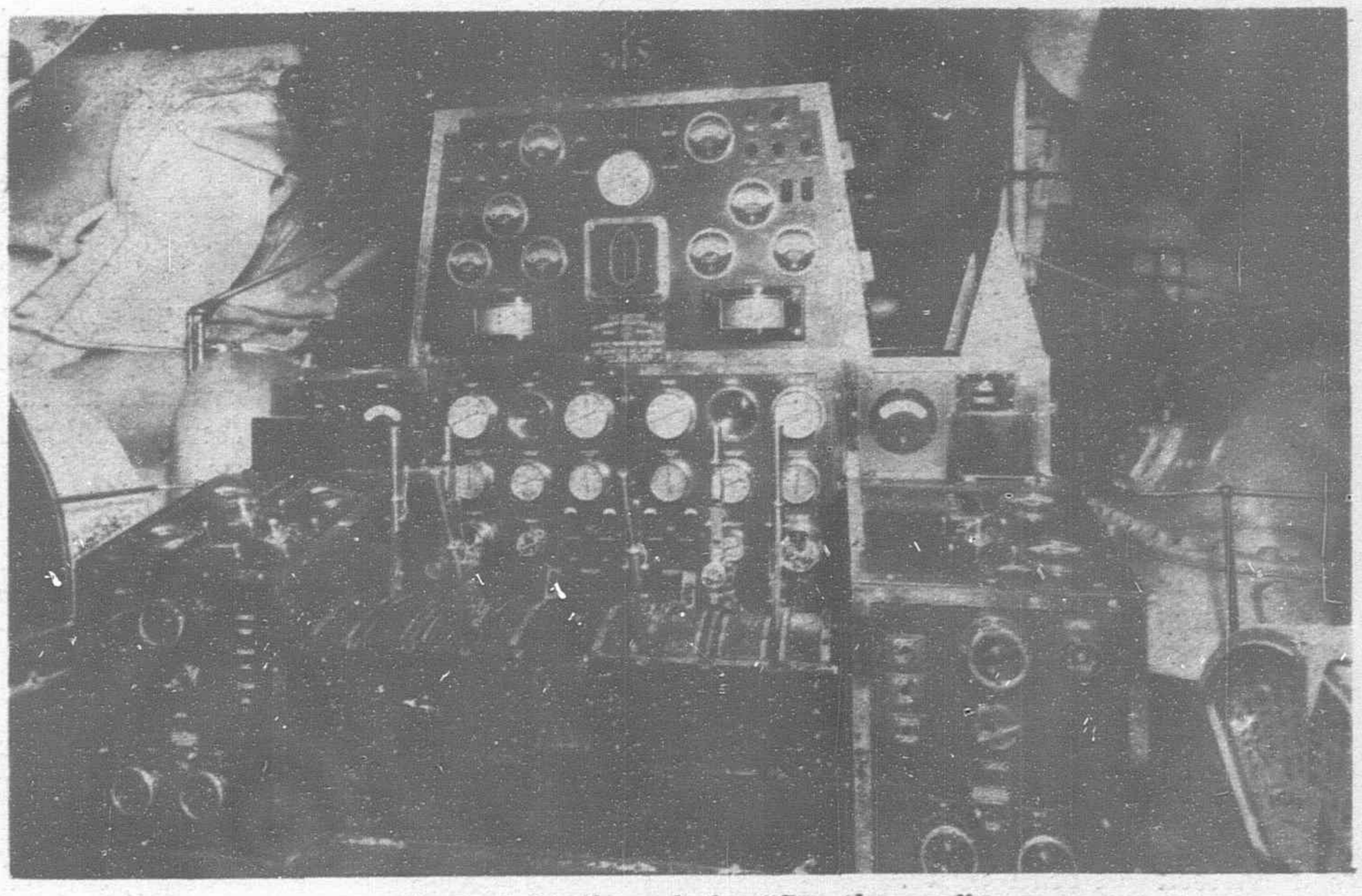
The scheme of decoration of the verandah café follows the lines of a typical Spanish sun parlor with details from La Cassa del Greco, with fine wrought-iron grilles to the windows and bar front. Tiled dummy fountains between the window bays form a special feature. An American bar is fitted at the forward end of the room. Comfortable furniture and a quaint Spanish tiled floor give this spacious room an air of distinction. Considerable use has been made here, and in other parts of the ship, of Lloyd Loom furniture by W. Lusty & Sons, Ltd.

The reading and writing room is *en suite* with the smoking room, but with the panelling in English cedar and fine Queen Anne walnut furniture.

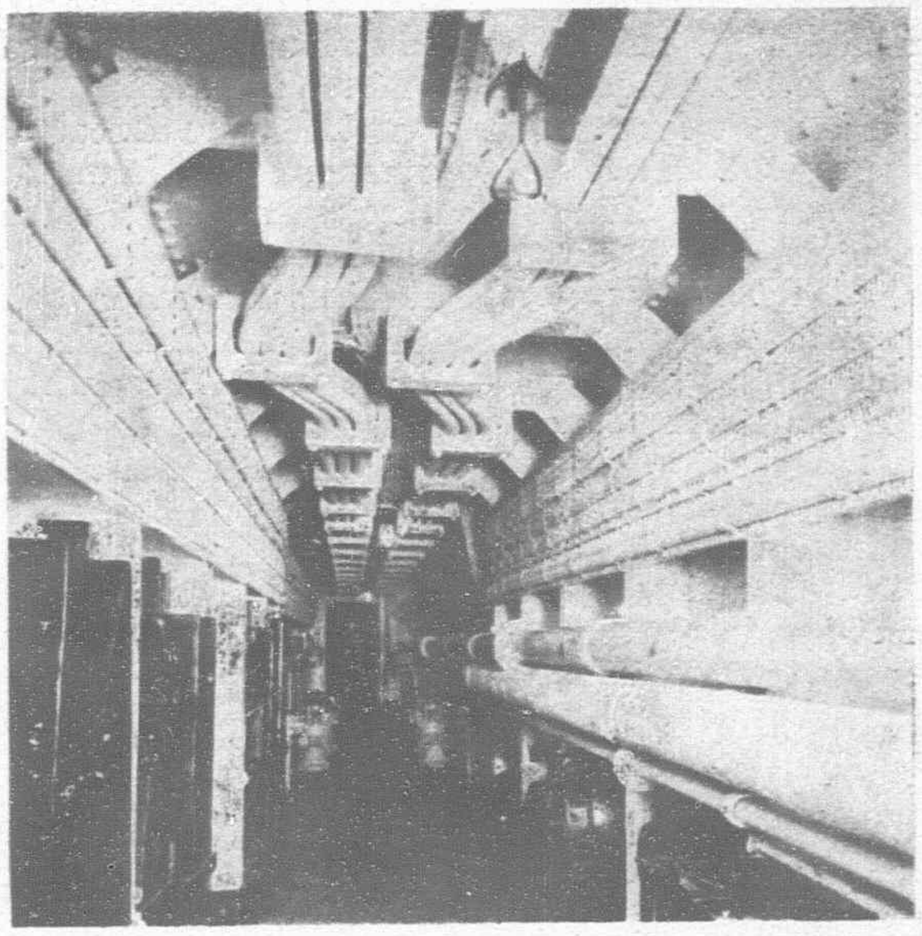
Between the corridor lounge and the smoking room is a large open deck space with portable glazed screens. These when let down provide a large sheltered area as shown on the deck plan. This is used for dancing and for cinematograph shows, one of the latest types of B.T.-H. "talkie" apparatus having been installed for the purpose, in addition to sound-amplifying equipment for the reproduction of music and speech in various parts of the ship.

Special steel houses to accommodate the cinema and music loud speaker units have been arranged, and can be brought into operation for the first saloon dancing space on B deck and the tourist class dancing space on E deck.

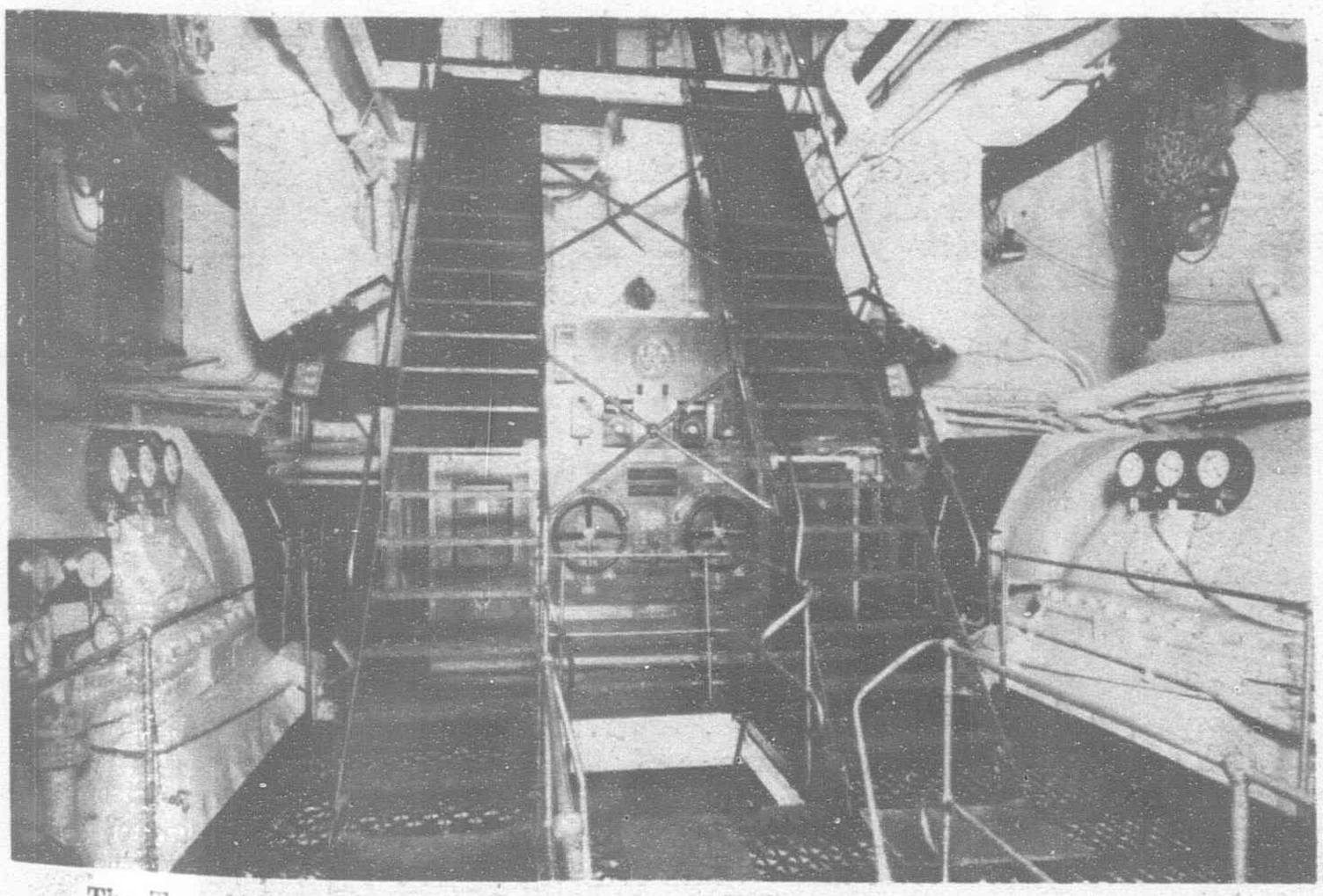
One of the most interesting features of the ship is the first saloon swimming pool which has been arranged on C deck aft and with its fine windows and hinged screens can be made into a semi-open-air pool. The flooring is of vitreous green and black tiling, while the swimmers' walk is of black and Irish green marble. On a slightly higher level,



Control Station of the "Strathnaver"



Cable Tunnel



The Two 10,700 kw. Turbo-Alternators and the Back of the Control Panel

separated by a carved teak balustrade, is a range of well-appointed dressing rooms. The scheme of diffused lighting behind silver "fescolised" metal grilles is of a novel and pleasing character.

The *Strathnaver* carries two classes of passenger, first class and tourist class, the latter, superseding the second class, being a comparatively recent innovation on this run.

Tourist Class

The tourist class passengers are accommodated in very comfortable cabins on G and H decks, the larger number being two-berth cabins and the remainder four-berth cabins. There are some inner two-berth cabins on G deck arranged with a passage-way to the ship's side and having a sidelight in the ship's side.

The tourist class open-air swimming bath and additional promenade space are on D deck, the swimming bath being an ingenious contrivance fitting into one of the large after hatches.

A large deck house at the aft end of D deck is arranged as general and isolation hospitals, and at the aft end of E deck hospitals and surgery have been arranged for the use of first saloon passengers.

The captain and the ship's executive officers are accommodated in a large deck house at the forward end of A deck, and the engineers on E deck, the accommodation being furnished in a most handsome and comfortable style. The remainder of the ship's company is provided with excellent and roomy accommodation at the forward end of E, F and G decks.

Ventilation

Special care has been given to the ventilation of the vessel, which is effected by both natural and mechanical means.

All passengers' public rooms and living accommodation throughout the vessel are heated and ventilated by the Thermotank punkah louvre system, ample changes of air being

provided for the variety of temperature changes encountered on the London-Bombay and Australian service. The tourist class accommodation in way of the engine and boiler casings, all officers' and crew's quarters, hospitals, laundry, baggage rooms and the steering gear compartment, are also ventilated on the punkah louvre system.

Complete fire-extinguishing systems of both water and steam have been installed, and a Rich fire-detecting system has been fitted to all the cargo holds and 'tween decks, with the warning indicator in the chart house on the navigating bridge.

The equipment of life-boats and life-saving appliances, including two motor life-boats, complies with the latest requirements of the Board of Trade and the International Convention for the Safety of Life at Sea. The life-boats are of the Fleming patent, and are propelled by the hand lever principle.

Each life-boat is arranged under a set of Welin-MacLachlan boat davits, and in single tier. In addition to life-boats, Gradwell life rafts for 25 per cent of the persons on board are provided.

The refrigerating machinery room is placed immediately forward of the boiler room, and is equipped with three J. & E. Hall & Company's electrically driven machines with the necessary evaporators, brine pumps, and other auxiliaries. The insulated cargo spaces are cooled by brine grids, also by air, which is first blown over batteries of brine pipes.

The steering gear, made by Brown Brothers & Co., Ltd., Edinburgh, is of their four-cyclinder electro-hydraulic type, and is controlled from the navigating bridge by Brown's steering telemotor. The gear embodies two pumping units, with 60-h.p. motors by Laurence, Scott & Electromotors Ltd., each unit being capable of meeting all normal requirements. Provision is made for running both units should specially rapid steering be required. The equipment also includes a Sperry two-unit gyro-pilot, thus providing the ship with an efficient electric telemotor system, which assures rudder control in case of breakdown of the ship's telemotor system.

In conjunction with the Sperry gyro-compass with which the ship is fitted, the ship can be steered automatically by the gyro-pilot. The bridge unit contains the mechanism for detecting changes of course and determining the correct amount of rudder movement.

The *Strathnaver* is fitted with Kelvite compasses, Kelvite motor and hand sounding machines, Walker's patent Trident electric log with receiver in the chart house, and Kent clear-view screens. The navigational equipment also includes electric ship's telegraphs, look-out indicator, navigating light indicator and inter-communication telephones by Siemens Bros. & Co., Ltd., Woolwich.

A telephone communication system, provided by Alfred Graham & Co. Ltd. of Slough, has been designed to afford efficient service under conditions which would render any ordinary telephone apparatus inoperative. Through the medium of the Graham loud-speaking naval telephones of the "improved" type, the captain, or other responsible officer in charge of the bridge, is in direct communication with the engine rooms, boiler room, main switch-board, steering-gear compartment, forecastle and capstan deck aft, as well as other outlying stations upon which the efficiency and safety of the ship chiefly depend. An interesting instrument fitted at the engine room control panel is what is known as the Graham din-proof 'phone. Through the medium of this device extraneous sounds from the surrounding engines are cut out, and the voice alone comes through clearly and with ample volume to the distant station, which in this case is the chart room on the fore bridge.

Helm and Engine Indicator

A comparative newcomer to bridge and engine room indicators is Graham's combined helm and engine indicator. This appliance, which was first applied to the Atlantic Transport liner *Minnetonka*, consists of a dual-face bridge indicator (giving helm and engine signals on the fore bridge) in circuit with an engine room indicator fitted on the main control panel, the latter giving helm and engine signals in the engine room. The indicator board in the engine room of the *Strathnaver* is at the control station, and is shown in the illustration. Both of these indicators are capable of being separately controlled. The indicators are arranged to give one flash of light for every revolution of the shaft. Helm signals are given in steps of 5 deg. to a maximum of 35 deg., *i.e.*, helm hard over. With this indicator the swing of the lights, the swing of the wheel, and the swing of the ship are all correlative (clockwise or anti-clockwise) and immediately indicative, irrespective of any question of "port and starboard" or "right and left." Moreover, efficient dimming is provided to prevent any glare at night, although the same signals would be fully visible under tropical sunlight. The vessel is also equipped with a new form of clinometer with special damping effect. This also is made by Alfred Graham & Co.

Wireless and Echometer

The *Strathnaver* carries the latest type of Marconi wireless telegraph apparatus, comprising 2-kw. transmitters for long, medium and short wave-lengths and receivers covering the whole commercial wave-range, with additional units for strengthening weak signals and reducing interference. To assist the navigators, the Marconi direction finder with the fixed-frame aerial is installed, the direction-finding instrument being fitted in the wireless cabin. Other safety wireless apparatus includes an emergency set working from an independent source of power, and life-boat sets.

In addition to this wireless equipment, the *Strathnaver* is fitted with the latest type of Marconi sounding device, the Echometer, which gives instantaneously and without the use of the ship's dynamo, the depth of water immediately under the ship. This instrument is silent in operation and can be switched on by the officer on watch and left running as long as it is required without causing any disturbance to the passengers or crew. In addition to these advantages, the system of transmission employed is such that the signal is sent in the form of a beam straight from the bottom of the ship to the sea bed and reflected back again, being picked up by the hull fitting, which acts both as a transmitter and receiver.

There are six cargo hatches with steel hatch covers. They are arranged three forward and three aft. These are served by 19 cargo derricks which are carried by the two masts and four derrick posts, the latter being placed suitably in regard to the hatchways. The derricks were made by the British Mannesmann Tube Co. Ltd. For erving the derricks, 22 cargo winches, electrically driven, are employed. These winches are of Laurence Scott & Electromotor's standard design.

The equipment of the windlass and forward capstans, also the after capstans, were all supplied by Clarke, Chapman & Co. Ltd., and are electrically driven. The windlass motors are placed on the deck below, and are arranged to drive the windlass through worm and spur gearing. The motors are of the totally enclosed, ventilated type giving 120 b.h.p. at a speed of 375 to 1,125 r.p.m.

Laundry Equipment

A comprehensive equipment of modern laundry machinery has been installed by James Ritchie Limited, Glasgow.

This laundry plant is driven through line shafting fitted with ring oiling, self-adjusting bearings. Ritchie enclosed ventilated type electric motors are provided for driving the various machines. Each of the motors is of ample power to drive the whole plant simultaneously if desired. The motors can also be arranged to drive the appliances separately.

Some of the cooking apparatus was supplied by John Philips & Co., Glasgow, electricity and steam being the methods adopted, electricity where dry heat is essential and steam where speed is necessary.

Propelling Machinery

The main propelling machinery, supplied by the British Thomson-Houston Co. Ltd., Rugby, consists principally of two separate turbo-alternator sets, each with its own condensing plant and auxiliaries, two double-unit synchronous motors, which are coupled direct to the twin-propeller shafts, a contactor cubicle to control the power from the alternators to the propulsion motors, and two balancer booster sets for excitation purposes.

The ratings of the machines are :—Two B.T.-H. impulse-type turbo-alternator sets, rated 10,700 kw., 3,000 r.p.m., 3,000-volts, 3-phase; two double-unit synchronous propeller motors, each rated 14,000 s.h.p., 125 r.p.m., 48 pole, 3,000-volts, 3-phase.

The turbines are of the multi-stage impulse type, with stainless steel blading and nozzle plates throughout. The turbines are constructed to withstand a maximum boiler pressure of 425 lb. at a total temperature of 725° F. The high efficiency servo-motor control is used for automatically adjusting the steam supply to the nozzles to keep the length of the steam belt proportional to the

load. A special wide-range governor is used for permitting a variation in speed between 3,300/750 r.p.m.

The alternators are designed on results obtained from this class of machine when used for ship propulsion equipments. They are totally enclosed and self-ventilating, the ventilating air being forced through the machine by fans mounted at each end of the rotor, and the discharge air, before it is again circulated through the machine, is cooled by air coolers mounted below the alternators. Embedded temperature detectors are provided to indicate temperature of internal windings at all loads.

The propeller motors are the double unit type, each motor having two separate and distinct stator and rotor windings, also two separate magnetic systems mounted in a common frame. In the event of one section failing electrically it would be disconnected and the motor run at approximately half power. The motors are of the fabricated steel type construction, enabling the frames to be very rigid, while, at the same time, permitting the weight to be reduced to a minimum. The bearings are carried on facings provided on the fabricated end shields of the motors. Lubrication of the bearings is self-contained and is carried out by means of a disc fitted on the shaft at the outer end of each bearing housing which dips into the oil well, and the deposited oil is wiped from the disc by means of a scraper and circulated through grooves in the bearing liner. The motors are forced ventilated by means of motor-driven centrifugal fans which discharge the hot air from the motors through air coolers into the motor room. The inlet air enters from the motor room through the openings in the end shields, and after passing through the motors is led to the inlets of the fans. Embedded temperature detectors are placed in the bottom of several slots so that the temperature of each can be indicated at all loads.

Two balancer booster sets are provided as an efficient means of obtaining from the 220-volts auxiliary bus-bars the necessary power for excitation purposes for normal and manœuvring conditions. One set meets all conditions and the second set acts as a complete standby.

Handwheels for operating the isolators are provided at the forward end of the instrument panel to enable each alternator to be electrically connected to its respective propeller motor or either of the alternators to be connected to both propeller motors.

The whole of the control cubicle is "mistake-proof," and with the special interlocks, incorrect switching is impossible. For example, whenever it is necessary to open or close an isolator, it is essential to have all the levers in the "off" position. Controls are interlocked so that damage cannot be done to any portion of the equipment when manœuvring by an unskilled operator. At the same time, indicating instruments are provided by means of which an operator can carry out orders in a short time with a minimum of manual effort.

There are six levers, one group of three for controlling the port and the other group of three for controlling the starboard side. The two outer levers are direction levers for ahead or astern rotation of the propellers; the two inner levers are field levers for excitation of the alternators and propeller motors; and the middle levers of each group are speed levers for controlling the speed of the turbines from dead slow to 3,300 r.p.m.

On the instrument panel and control cubicle all important gauges are centralized and a fault on any part of the propelling equipment would be easily detected. In the case of certain serious faults, attention is attracted by the ringing of alarm bells.

For supplying all the auxiliary, lighting and cooking loads, three B.T.-H. 750-kw., 6,000/670 r.p.m., 220-volt geared combined condenser turbo-generator sets have been installed. The turbines are of the standard B.T.-H. impulse type with stainless steel blading and nozzle plates throughout. For these sets automatic nozzle control is fitted. The gearing is of the single-reduction double helical type, and the generators of open compound wound type.

For port duty, one B.T.-H. 400-kw., 4,500/1,000 r.p.m., 220-volt geared combined condenser turbo-generator set has been installed.

Condensers

There are two main condensers of the Weir regenerative type underslung from the turbines and having a total cooling surface of 32,000 sq. ft., the capacity of the condensers being sufficient to maintain a vacuum of 28-in. of mercury with a sea temperature of 82° F. The water level in the condenser is maintained by a float-operated valve. There are four main motor-driven circulating pumps, each capable of delivering 10,000 gallons per minute. The main feed-water circuit is on the Weir closed feed system and comprises the two sets of electrically driven extraction pumps of Drysdale's make and two sets of steam jet air ejectors.

The extraction pumps withdraw the condensate from the reservoirs in the main condensers, and deliver through the three-stage air ejectors, drain coolers and low-pressure heaters to the main feed pump suction. The main feed pumps are of Weir steam turbine-driven rotary type, two in number, each capable of delivering 35,000 gallons per hour against a discharge pressure of 500 lb. per sq. in. through intermediate and high-pressure heaters to the feed-water regulators on the boilers, the intermediate and high-pressure heaters being of the usual Weir multi-flow type.

The evaporating and distilling plant for the water-tube boilers comprises two Weir vertical h.p. evaporators, each capable of evaporating 50 tons per day when supplied with direct boiler steam, one Weir low-pressure evaporator of horizontal design to deal with fresh distilled water and capable of evaporating 70 tons of water per day, the evaporating steam being bled from a low stage of the turbine and the vapor led into the L. P. feed heater. By this means the water to the water-tube boiler is double distilled.

In addition, there are two Weir distilling condensers each capable of producing 50 tons of pure fresh water per 24 hours, one electrically driven centrifugal sludge pump capable of withdrawing 700 lb. of sludge per hour, and two Wyndham-type heaters fitted in parallel on the supply feed to the high-pressure evaporators, the heating of the feed being done by the distilled vapor.

A fresh-water distilling plant is fitted for domestic use. This comprises two Weir vertical evaporators of the high-pressure type, each capable of evaporating 35 tons of pure fresh water per 24 hours when supplied with direct boiler steam at a pressure of 230 lb. per sq. in., two Weir vertical distilling condensers, each capable of condensing 35 tons of vapor per hour, and two Weir fresh-water filters suitable for working in conjunction with the above distillers.

There are two bilge and ballast pumps, each of 225 tons per hour capacity against 60-ft. head for bilge and ballast duty, and 100 tons per hour against 180-ft. head for fire duty, one emergency bilge pump of the same capacities, one auxiliary bilge pump capable of delivering 50 tons per hour against a 60-ft. head, and three fresh-water pumps each capable of delivering 35 tons per hour against 120 foot head, all of the Drysdale electrically driven Centrex type. There are also fitted one electrically driven bath-heater pump capable of delivering 10,000 gallons per hour against 120-ft., two electrically driven vertical sanitary and bath pumps, each capable of delivering 200 tons per hour against 150-ft., and two auxiliary circulating pumps.

The main feed filter, having a capacity of 300,000 lb. per hour, and auxiliary feed filter with a capacity of 33,000 lb. per hour, are fitted in duplicate, so that one can be overhauled while the other is in use. They were supplied by Caird & Rayner.

The propellers are of manganese bronze, each having four blades cast solid with the boss, and supplied by The Darlington Forge Limited.

The line shafting is forged from solid ingots of mild steel, and fitted with Michell thrust and bearing blocks. Motor-driven turning gear, working through worm-and-wheel gearing, is fitted to each main shaft.

Boilers

Steam for the main turbines is generated in four Yarrow oil-fired water-tube boilers, the boilers being of the latest double-flow type and fired at the side. Each boiler has five drums, three water drums, steam drum, and superheater drum. The superheater is of the Yarrow self-draining type with steeply inclined tubes. A multi-tubular air heater is situated above each boiler, so that the gases pass through the heater on their way to the funnel. The furnace casings are arranged so that the air leaving the air heater circulates through them on its way to the burners.

All the steam and water drums are made from steel forgings, thereby dispensing with longitudinal riveted seams, the dished ends only being riveted. The dished and flanged boiler drum ends and man-hole doors were supplied by Charles McNeil Limited. The boilers and air heaters were designed and built by Yarrow & Co. Ltd., and erected on board by Vickers-Armstrongs Limited. The boilers and air heaters for the sister ship *Strathaird* are being built at Barrow.

The four main boilers each have the following leading particulars :—

Generating heating surface	12,500 sq. ft.
Superheating surface	6,575 sq. ft.
Air heating surface	14,125 sq. ft.
Combustion chamber volume	2,733 cub. ft.

The tubes in the tube nests bordering the furnaces are 2-in. external diameter, the remoter rows being 1⅜-in. external diameter. The superheater loops are 1¼-in. external diameter. The tubes are of cold solid-drawn steel, expanded and bell-mouthed both at steam-drum and water-drum ends. These boilers were fully described by Mr. Harold E. Yarrow in the paper which he read before the Institution of Naval Architects on March 27, 1931.

In addition, two auxiliary boilers of a single-flow type, but front-fired and of a smaller capacity, are installed for supplying the turbo-generators in port. These boilers are coupled to the main steam ranges and, if required, can assist the main boilers at sea.

The two auxiliary boilers each have the following leading particulars :—

Generating heating surface	3,000 sq. ft.
Superheating surface	970 sq. ft.
Air heating surface	3,400 sq. ft.
Combustion chamber volume	620 cub. ft.

The designed working pressure of the boilers, main and auxiliary, is 400 lb. per sq. in., with a blow-off pressure of 425 lb. per sq. in., while the steam is superheated to a final temperature of 725° F.

The boilers are arranged in one stokehold, and burn oil fuel under the Todd system in conjunction with Howden's forced-draught fans, one fan being installed per boiler.

The eight suction and discharge strainers for the main oil-fuel burning installation and the two similar strainers for the auxiliary oil-fuel equipment were supplied by Auto-Klean Strainers Limited.

There are, in all, 19 Auto-Klean strainers on this vessel, all those in connection with the oil-burning fuel system having been supplied by Auto-Klean Strainers Limited. There are four suction strainers and four discharge strainers for the main boilers, and one suction and one discharge strainer for the auxiliary boiler oil-firing apparatus. These strainers are designed so that the only attention they require at sea is that the strainer handles shall be given one complete turn once a watch, and the dirt cleared out of the strainer sumps while the vessel is in port, thus completely obviating the necessity of breaking cover joints and removing gauze baskets when cleaning, which is the usual practice when ordinary gauze strainers are fitted.

There are four 4-in. Auto-Klean lubricating oil strainers fitted in connection with the forced-lubrication systems of the main turbines, each strainer being designed to deal with 7,200 gallons per hour on the discharge side of forced-lubrication pumps. The straining mesh is equivalent to 80 by 80 per sq. in., and four similar but smaller strainers are provided for the turbo-generator forced-lubrication systems. A 2½-in. Auto-Klean strainer has been installed at the lubricating oil-filling station to ensure that the lubricating oil is strained efficiently when it is received on board, and before it passes into the storage tanks.

The feed water is controlled on each boiler through the medium of a Mumford feed regulator. Distance water-level indicators of the Igema type are installed to enable boiler-water levels to be read at stokehold floor level.

Two large calorifiers are installed in the engine room, these having been supplied by Royles Limited, Irlam, near Manchester.

The boilers are fitted with Cockburn high-lift safety valves and self-closing type of stop valve on the superheater.

The water-softening plant consists of two Basex units, each 18-in. diam., supplied by the Paterson Engineering Co. Ltd., London. Each is arranged to operate as a single unit or in parallel. They are provided with brine-preparing tank and steam jet elevator and one pressure sand filter, 2-ft. diam., with steam jet air injector, the latter for the periodic cleansing of the sand-filtering media. The capacity of this plant is 470 gallons per hour to zero hardness, and 3,760 gallons between regeneration. This latter operation can be carried out in about 20 minutes.

Mono CO_2 recorders are fitted for the boiler plant, while Negretti & Zambra temperature indicators are used on steam, water and oil ranges, also on the superheater outlet of each main boiler. There are 10 distance-type mercury-in-steel dial thermometers for the temperature of the main steam in the boiler room, turbine main and exhaust steam, and pump and main feed discharges; two nine-point thermo-electric pyrometers for funnel gas and air-heater temperatures; and two six-point electrical resistance thermometers for indicating the temperature of the lubricating oil and inlet and outlet water.

Soot-blowing arrangements on the boilers and air heaters are dealt with by blowers of the Parry type.

In connection with the main and auxiliary steam ranges, to accommodate the high-temperature expansion difficulties, Aiton, of Derby, supplied the necessary expansion pipes and bends of their corrugated type.

Oily bilge and ballast water is handled by a Comyn separator of a new type, this having been supplied by Separators Limited, Glasgow.

During trials a speed of 23.003 knots on 21,900 tons displacement was reached. The consumption tests showed that at this displacement the *Strathnaver* will, at 20 knots, consume 136 tons of oil fuel per day, 100 tons at 18 knots and 70.3 tons at 15½ knots. These fuel consumptions are taken for all purposes, including hotel load, and with the ventilating apparatus and so on, operating under full working conditions during trials.

Soviet Railway Transport

(Continued from page 124.)

Returns for the first half of 1931 showed that the number of passengers carried was 308.2 million, or 24.5 per cent over the same period in 1930. The total program for the year was set at 732 million, or 60 per cent in excess of the schedule for the last year of the Five-Year Plan (1933).

The average density of traffic on the railroad network in the Soviet Union in 1930 was estimated at 1,738,000 ton-kilometers per kilometer, greater than either that of the United States or any European country; in Germany it was 1,133,000 ton-kilometers, England 887,500, and in the United States 1,608,000 ton-kilometers per kilometer.

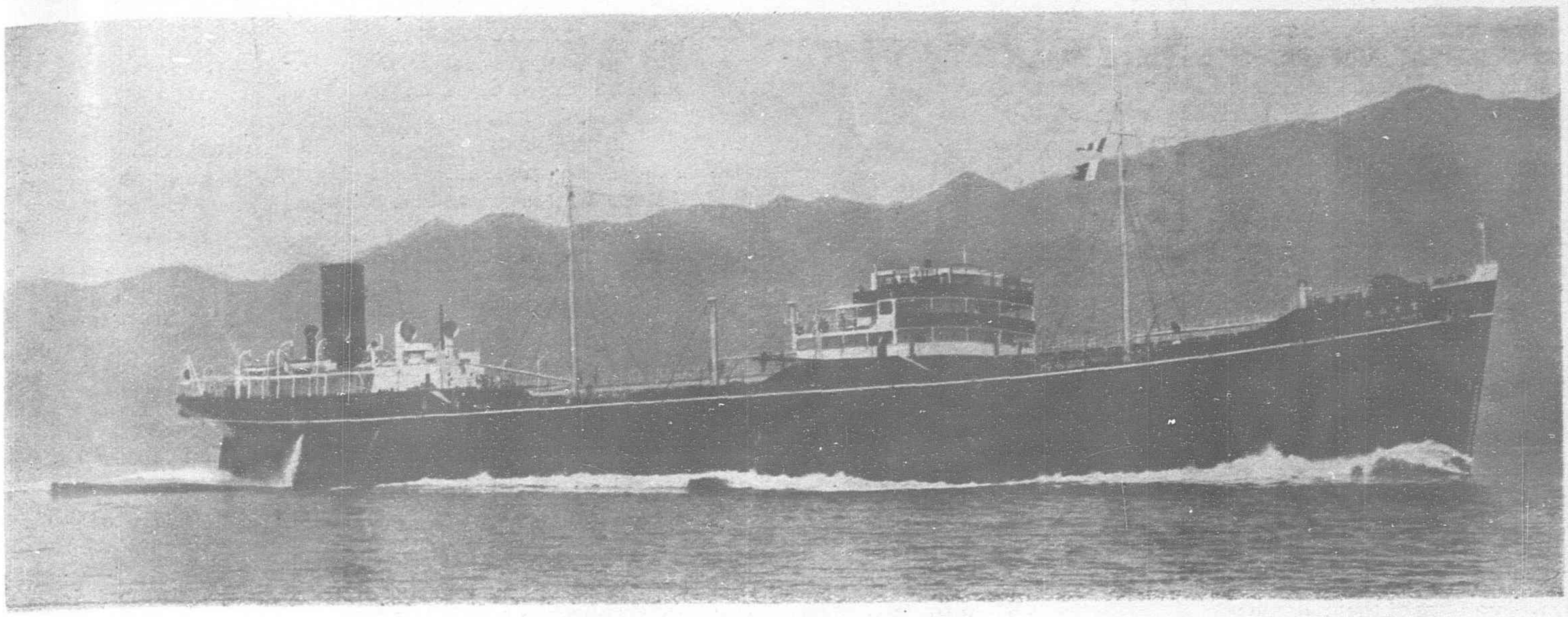
The average daily run of a freight locomotive has been speeded up considerably, having reached 174 kilometers (109 miles) daily during the second quarter of 1931, as compared with 132 in 1930 and 118 in 1913, the last pre-war year. Similarly, the distance covered by freight cars has increased, reaching a daily average of 98 kilometers (61 miles) during the second quarter of 1931, as against an average of 94 in 1930 and 72 before the war.

Reorganization Program

The program for modernizing Soviet railroads outlined at the beginning of 1931 included the extensive introduction of block-signalling, automatic coupling, air brakes and electrification. These measures had been decided on in conjunction with American railroad experts. The results of progress made are reported as being far from satisfactory. Only a small part of the annual plan for block-signalling (2,000 km. of railroads were scheduled) was accomplished during the first nine months, and of the general plan for electrification, for which 31,300,000 roubles were assigned, only about a fifth was completed. These shortcomings are attributed to delays in the construction of factories for railroad supplies generally, which were in turn retarded through lack of supplies of necessary materials. Considerable stress is laid on the necessity for mechanized loading and unloading of freight as well as the greater use of modern machinery in railroad construction.

Electrification is planned to cover 3,215 km. (2,010 miles) of railroads within the next two years, 475 km. of which will be for passenger service. Especially those roads in the mining sections (Donetz Basin, Kuznetz Basin, Urals) are to be electrified. Thirty electric locomotives are scheduled to be built in 1932.

In the opinion of the new Commissar for Transportation, A. A. Andreyev, much more could be accomplished with the existing rolling stock, etc., through greater rationalization of work. By increasing the average daily run of a locomotive by one hour, the work of an additional 1,400 locomotives could be accomplished and by a similar method 8,000 freight cars would be available for goods transport.



Motor Vessel "Fujisan Maru" on Trials

The World's Fastest Motor Tanker "Fujisan Maru"

Epoch-making Single-screw Oil-carrying Ship Records 18.8 Knots on Trial—Many Unique Features in Design and Construction

By TAN Y. TAJI, M.Eng., M.I.N.A., M.I.Mar.E.

"THE vicissitude is the fashion of the world," so to ears of Buddhists "the bell of the Gion monastery tolls the transitoriness of all things." It is true, that the "blue riband" of the Derby of the last Season cannot necessarily be the favorite this year. So, it is not at all surprising that the m. v. *Teiyo Maru*, the winner of the speed record in the world's tanker fleet last May, was beaten within four months' time by the new motor tanker *Fujisan Maru*, which attained a mean speed of 18.8 knots on her official trials in August of the same year against the former's 17.53 knots. It is significant, however, that both ships are under the same national flag.

The *Fujisan Maru* was constructed by the Harima Shipbuilding and Engineering Co., Ltd. to the order of Iino Shoji Kaisha, Ltd. for service between Japan and the United States.

The leading particulars and general characteristics are as follows :—

Length over all ..	512′ 0″
Length between perpendiculars	490′ 0″
Breadth moulded ..	65′ 0″
Depth moulded ..	37′ 0″
Full load draught ..	27′ 10.8″
Dead weight capacity, tons	12,501
Cargo oil capacity, cub. ft.	542,500
General cargo capacity, cub. ft. ..	105,000
Gross register tonnage	9,524.30 tons.
Net register tonnage	5,440.26 tons.

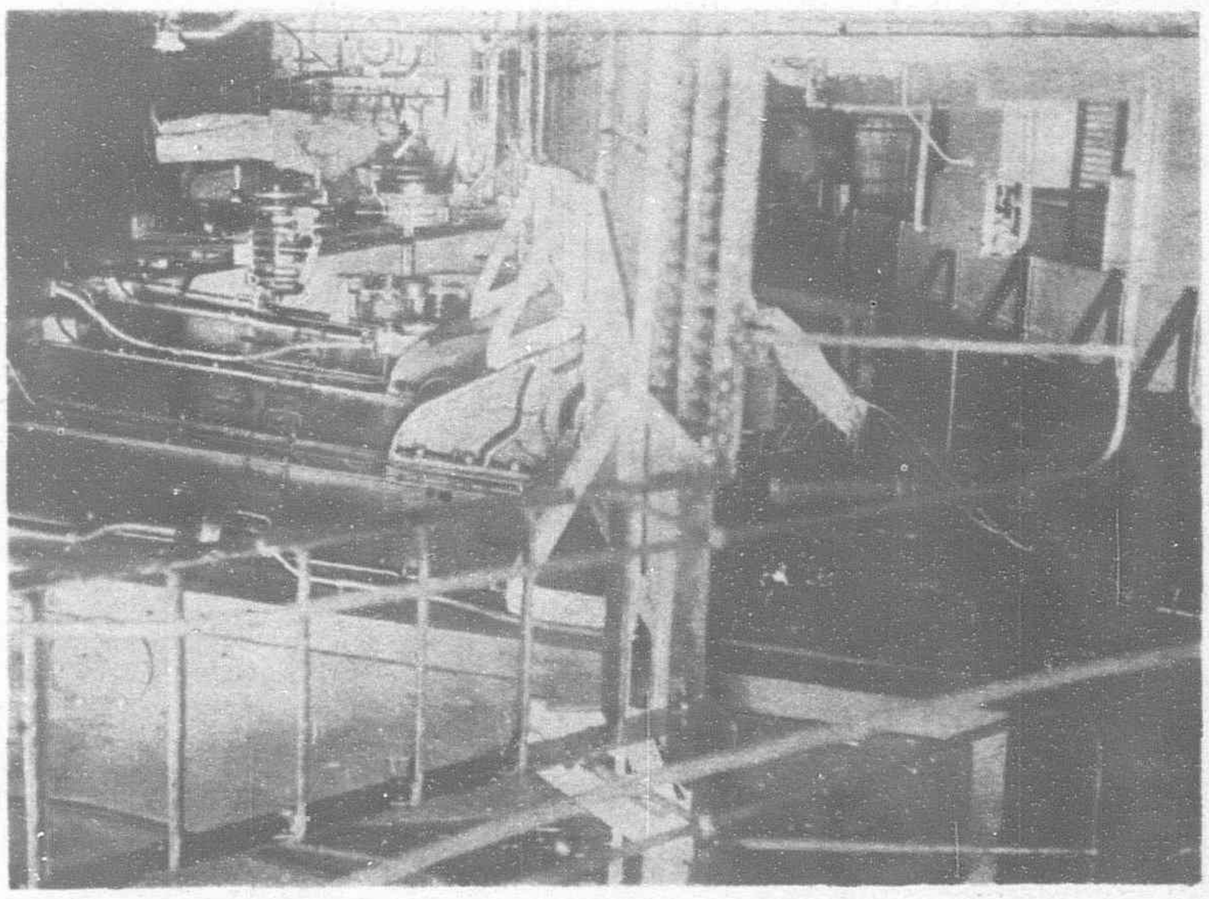
Main engine :—

One set of M.A.N. double-acting, two-cycle, airless-injection Diesel engine.

Normal output	7,200. b.h.p.
,, r.p.m.	113
Mean trial b.h.p.	9,390
Trial speed, knots	18.8
Sea speed (fully loaded), knots	16

Class :—

100A1. -and L.M.C. by Lloyd's Register of Shipping. "First class ocean-service vessel" by the Imperial Japanese Government.



Manoeuvering Platform of Main Engine of the "Fujisan Maru"

Special Features

1.—*Single-screw High-power Engine.*—There is no record in the world of a *single-screw* vessel so highly powered as the *Fujisan Maru* propelled by a single set of Diesel engine, developing 7,200 b.h.p. normally and 9,380 b.h.p. at full power.

It is a well-known fact, that single-screw vessels have many propulsive advantages such as a higher speed, a lower fuel consumption, easy manoeuvering, etc., yet this type with a powerful engine has been avoided as far as possible for oil tankers in view of the great vibration. The Harima Dockyard, however, achieved the successful construction of the ship, embodying with all the

advantages of a single-screw vessel but without any significant vibration.

The result was quite astonishing. The vessel attained a mean speed of 18.8 knots on her official full-power trials and a speed of 16.605 knots at full load, while there was no sensible vibration in both cases. The success in the prevention of vibration is the result of special precautions taken in the fundamental design of the hull construction and particularly for the engine bearers.

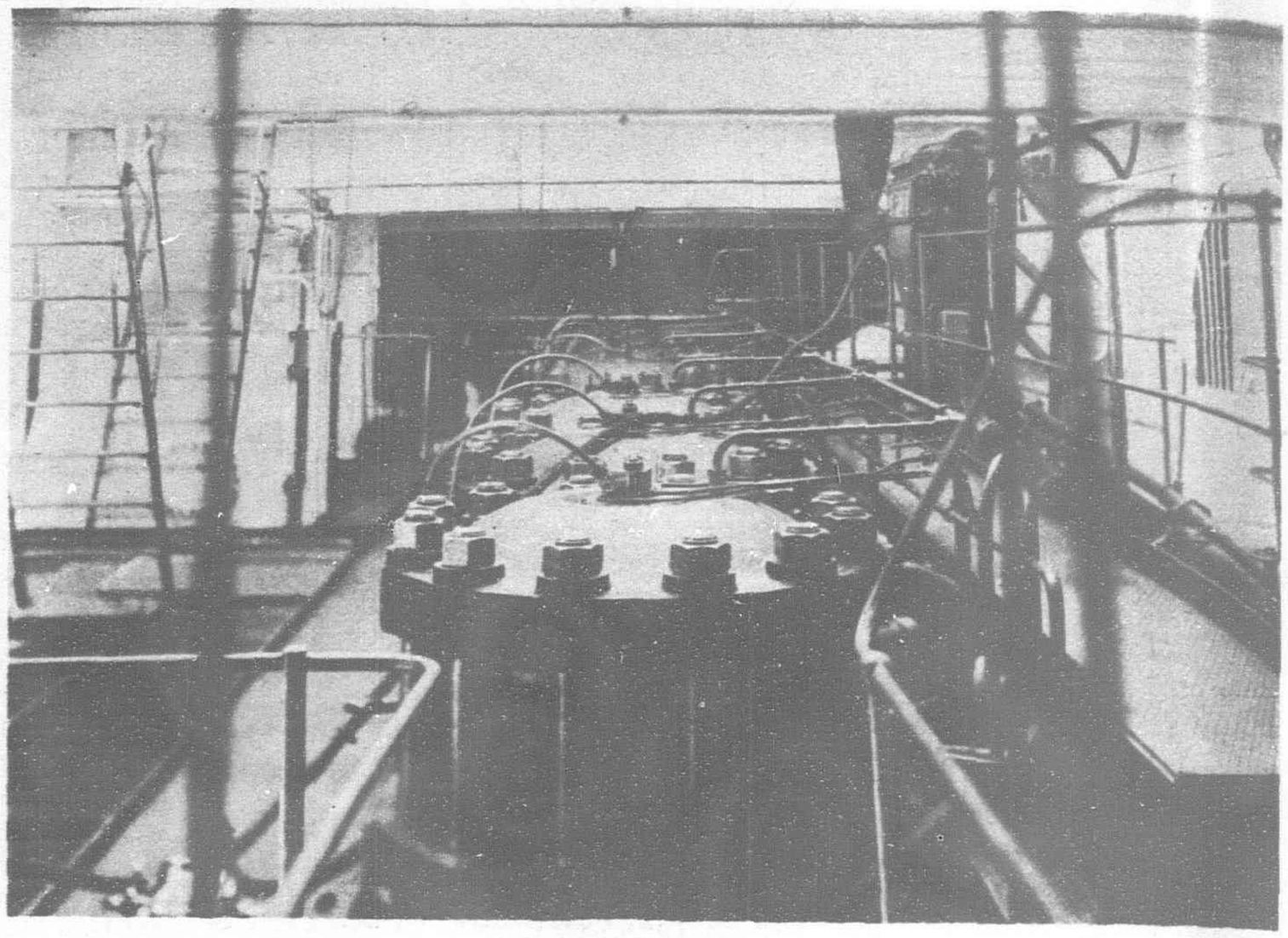
2.—*Special Hull Construction.*—Not only in view of the single powerful propelling machinery of unprecedented capacity, but also from bitter troubles experienced in several oil tankers due to inadequate longitudinal strength and the consequent heavy expenditure incurred for repairs, compensation and reinforcement, the vessel is constructed under a special system after authentic consultation with Lloyd's Register.

Two rows of longitudinal continuous oil-tight bulkheads are arranged, practically throughout the whole length of the ship, while transverse bulkheads are so arranged as to have uniform distribution of the transverse strength. Structural materials are carefully disposed at the forward end of the long poop as well as at the fore and aft ends of the bridge in order to avoid any abrupt change of the strength, and further the engine bearers are strongly connected to the longitudinal bulkheads for the same reason.

3.—*Loading and Unloading of Cargo Oil.*—The main pump room is arranged near amidships, where three sets of steam driven heavy cargo oil pumps of 400 tons each and a 40 ton vertical bilge pump are installed, the pressure for the former being 150 lb. per sq. in., while the latter at 30 lb. per sq. in. There is also an auxiliary pump room in the forward cargo hold, where an 80 ton bilge pump is provided.

Two lines of the main oil suction piping of 12-in. bore being extended longitudinally throughout the central oil tanks with necessary branch piping to each wing oil tank, and being connected with each other at the fore and aft ends, cargo oil can be pumped out from any individual tank or simultaneously from all tanks by means of three main pumps, and moreover oil can be freely transferred between any oil tanks.

The rising main from the pumps to the upper deck is 17 inches in diameter, and one line of the main delivery piping of 12-in. in diam. is fitted at portside on the upper deck and poop deck, extending nearly over the whole length of the ship from the forward cargo hold to the aft end of the poop deck. Delivery connections being provided at four important positions at the fore and aft ends and near amidships, cargo oil can be speedily delivered with the simultaneous operation of three powerful oil pumps. Thus, time required for the loading and unloading of cargo oil can be considerably saved.



Top of Main Engine

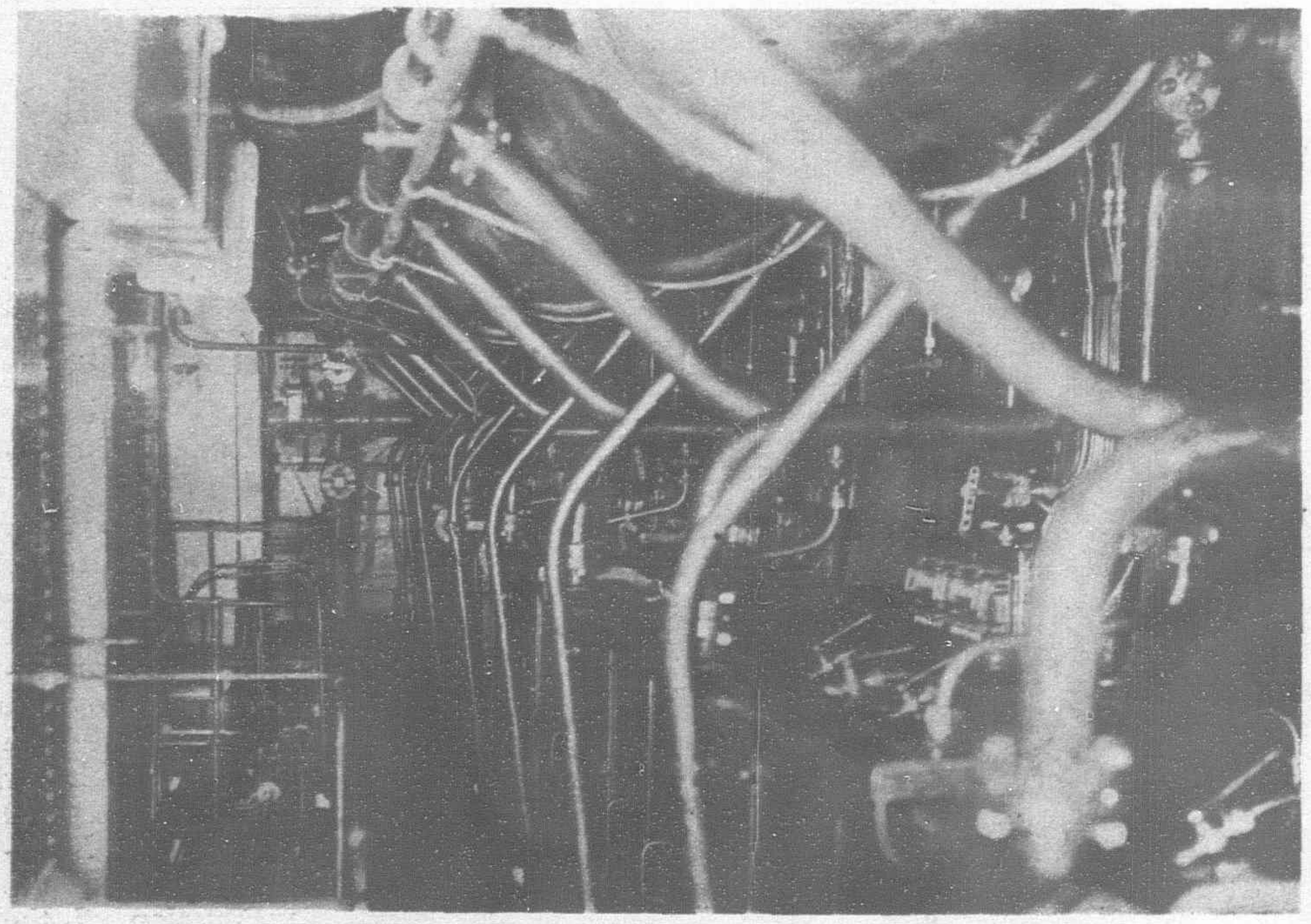
4.—*Fire Annihilating Appliances.*—The vessel is equipped with special fire annihilating appliances utilizing boiler flue gas or exhaust gas, which were wholly manufactured by the Harima Dockyard and first applied to the ship in Japan. The principal parts of this system comprise two steam ejectors, one gas washing tank, one safety valve, one float gauge and one preserver valve to each oil tank. Flue gas from the boilers is first cooled and washed, and then is delivered to the holds to fill up all unoccupied spaces, no matter whether cargo oil is in the holds or not, in order to annihilate the existence of any combustible or explosive gas. Special devices are provided for easy control of this gas in filling or releasing.

Owing to the adoption of this system, the capacity of oil tanks is measured by float gauges, instead of usual pneumacators. This method is also very handy and accurate in measurement, as it is independent of the specific gravity of cargo oil.

The complete fire annihilating system as well as the gauging system have been proved very efficient in actual tests in spite of unskilful handling.

5.—*Light Load Condition.*—The provision of a single center line bulkhead is usual practice in oil tanker design, so that the capacity of each oil tank is generally very large, and in light condition it is necessary to have ballast water at half tanks in order to get suitable draught for navigation. As the effect of a lower center of gravity of the ship and of the free water surfaces in the tanks, officers and crew have often suffered from the heavy and irregular rolling of the ship at sea.

In this vessel, not only for strength's sake but also to avoid such disadvantage, two rows of continuous longitudinal bulkheads are arranged, the whole cargo oil space is subdivided lengthwise into three rows of oil-tight compartments, and ballast water is fully filled in the central tanks only. Thus, the most suitable draught can be acquired for navigation at light load, while a higher center of gravity of the



Back of Main Engine

ship and no free water render the behavior of the ship comfortable at sea.

6.—*Provision for the International L.W.L. Convention.*—In accordance with the latest International Convention for the Safety of Ships at Sea, the freeboard of tankers can be reduced by 15 per cent, if certain provision is made in the original hull, as is specified in the regulations. The *Fujisan Maru* having been constructed and equipped in compliance with the new regulations, her cargo oil carrying capacity can be increased by about 1,000 tons and the oil tanks have ample capacities to meet this extra loading.

Main and Auxiliary Machinery

Main Engine.—The vessel is propelled by one set of M.A.N. double-acting, two-cycle, airless-injection engine with seven cylinders of 700 mm. in bore, 1,200 mm. in stroke and with a normal output of 7,200 b.h.p. at 113 r.p.m. The engine developed 9,395 b.h.p. on the official trial at a mean ship's speed of 18.8 knots which is an unprecedented record in this class of vessels.

Scavenging air is supplied by a Brown-Boveri's electric double-drive type turbo-blower with a capacity of 950 cub. meters per min., while exhaust gas is led to a silencer in the funnel through the upper and lower manifolds or can be led to an exhaust gas boiler.

The cooling of cylinder jackets and covers is effected by sea water, while the pistons and injection fuel valves are cooled by fresh water. For this purpose, two sets of electric driven combined salt water and fresh water pumps are provided, each having a capacity of 130 cub. meters per hour for fresh water and 430 cub. meters for salt water. Cooling fresh water is stored in a compensation tank and fresh water tanks in the double bottom. Water delivered from pistons is collected in the compensation tank after having cooled through a fresh water cooler and then is circulated again to the main engine.

Fuel oil, being first settled in deep tanks and afterwards transferred into three service settling tanks, is delivered to the engine through fuel oil pumps. Two sets of Baltic type fuel oil purifiers are also provided.

Forced lubrication being adopted for crossheads, bearings, etc., two Neidig's electric driven lubricating oil pumps of 65 cub. meters per hour and a lubricating oil re-cooler of 48 sq. metres are installed.

Starting and manœuvering air is supplied at a pressure of 30 atms. by two sets of Balcke's vertical three-stage air compressors disengageably coupled to Diesel-generators. There are two 15 cb.m. air reservoirs for the main engine and one 40 litre air bottle for auxiliary Diesels and a vertical two-stage emergency air compressor disengageably coupled to the steam driven lighting set.

Auxiliary Diesels and Generators.—Unlike the m. v. *Teiyo Maru,* a considerable quantity of electric current being consumed in this vessel for various auxiliary machinery in the engine room, Brown's electric-hydraulic steering gear, refrigerating machine, ventilation fans, and for the lighting of the ship, etc., three sets of powerful Diesel-generators are installed in the engine room. Two of them are driven by M.A.N. single-acting four-cycle airless-injection trunk-piston type Diesel engines, each with seven cylinders of 275 mm. in bore, 420 mm. in stroke, developing 408 b.h.p. at 375 r.p.m., each generator being of 270 kw—230-volt D.C. compound wound type, supplied by the A. E. G. of Germany. The remaining set comprises a Diesel engine of the same type but with only four cylinders developing 235 b.h.p., and a D.C. compound wound dynamo of same make with an output of 155 kw. at 230-v.

The voltage for power current is 220, whilst that for lighting is 110-volts, a motor-generator of 13 kw. is installed in the engine room. This also supplies current to the wireless apparatus, electric fans, etc.

For the port use, a 10 kw. steam driven generator is provided, which can be also utilized as an emergency generator at sea.

Steam Generating Plant.—A considerable quantity of steam being necessary for the heating of oil tanks, driving powerful cargo oil pumps, deck machinery, etc. as well as for the heating of living quarters and the use in galley, baths, etc., two sets of single-ended Scotch boilers with Dahl oil burning system and one exhaust gas boiler of multi-tubular smoke tube type are installed in the boiler room on the aft upper platform of the engine room; a condenser, an evaporator, a distiller, pumps and other necessary auxiliaries being fitted therein.

The Scotch donkey boilers have a diameter of 13 feet, a length of 12 feet and a working pressure of 220 lb. per sq. in., while the exhaust gas boiler is of 11-ft. 1¼-in. in diam., 16-ft. 8-in. in length and a working pressure of 100 lb. These have been entirely built in the Harima Dockyard.

Propeller.—This is a four-bladed built-up type with aerofoil section, having a diameter of 5,400 mm., a pitch of 4,600 mm. and a developed area of 9.63 sq. meters, the blades being of manganese-bronze while the boss is of cast iron.

Trial Results

Various trials were carried out on the Inland Sea, and the results were entirely satisfactory to both the owners and the builders. In the official full power trial, a mean speed of 18.8 knots was attained with a mean output of the engine of 9,390 b.h.p., while in the progressive trial at the fully loaded condition 16.605 knots was recorded at 7,912.5 b.h.p. The fuel consumption of the main engine was measured as 161 grams per b.h.p. per hour in the four hour continuous running trial.

The summary of the trial results are given below :—

Kind of Trial	Progressive and 4 Hour Continuous Running Trial						
Draught	27′—10½″						
Displacement	18,750 T.						
Trial No.	1	2	3	4	5	6	4 hour continuous Running
Speed (knot) ..	8.870	14.188	15.441	16.605	12.306	15.795	
R.P.M.	60.25	97.0	106.75	118	82.75	113.17	112.8
App. Slip (%) ..	1.13	1.77	2.86	5.50	0.12	6.27	
Indicat mean Press (kg/cm²) T ..	1.51	3.78	4.36	5.70	2.56	5.42	5.33
B ..	1.21	3.24	3.94	5.27	2.29	4.98	4.84
I.H.P.	1,119	4,631	6,020.5	8,795	2,728.5	8,009	7,800
B.H.P.	842.8	4,119	5,415	7,912.5	2,346.5	7,208	7,020
Mechanical Efficiency (%)	75.25	89.0	90	90	86	90	90
Press in kg/cm²							
Piston Cooling Fresh Water ..	2.0	2.13	1.95	2.2	2.15	2.08	2.075
Cylinder Cooling Salt Water ..	1.15	1.1	1.15	2.3	1.3	1.3	1.3
Lubricating Oil ..	2.2	2.15	2.1	2.1	2.1	2.15	2.14
Scavenging Air ..	.125	.125	.125	.145	.116	.135	.135
Temperature °C							
Sea Water ..	25	25	25	25	25	25	25
Fresh Water T	28	30	31.5	33	29.5	32.3	32.3
Recooler outlet B	25	27	27	28	26.5	27.8	27.8
Lub. oil cooler outlet ..	26.5	26.5	27	27	27	27	27
Cylinder cooling water outlet.	33	39.8	43.9	49.6	38	47.2	46.2
Fresh Water Recooler outlet.	27	28	28.5	29.5	28	29.5	29.4
Piston cooling water outlet.	30.8	36.05	39.5	41.05	35.05	41.7	41.2
Exhaust Gas T	92.	148	205.5	302.	96.4	264.5	255
B	85.3	134	167.7	247.	83.6	222	212
Lub. oil at cooler outlet ..	28	28	29	29	29	30	30
Fuel Consumption Gr/H/b.h.p. ..	—	—	—	—	—	—	161
Admiralty Constant	585	490	482	408	561	387	

Automatic Traffic Control System is Adopted in Japan

(*Continued from page 127*)

When the hand-operated signals were abandoned for the automatic system in Tokyo, the newspaper *Nichi Nichi* printed a human interest story of which the following is a translation, showing that the discarding of an old system for a new one brings with it a sense of regret on the part of those who were attached to the former :

"It was at 3 p.m. on the 20th that seventeen traffic officers, all well burned by the sunshine, called a meeting in the rest room by the Miharabashi, Ginza, and held a gathering of farewell by sipping tea. This was an occasion of saying good-bye to the old traffic signals which they had handled for the last fourteen years, since the summer of 1917. The signals had only 'go' and 'stop' and they are now kept at the Tsukiji police station and will stay there forever as a token of the past. Then the seventeen traffic officers returned to take up desk work again at police head-quarters."

Engineering Notes

INDUSTRIAL

SHOWA STEEL PLANT.—Shingishu has been chosen as the site for the Showa Steel Works to be established by the Japanese Government, according to Overseas Minister Hata. With the Government's decision to establish the Showa Steel Works in Shingishu, Governor Uchida of the South Manchuria Railway, who has been advocating the choice of Dairen, may tender his resignation, it is surmised.

FUNDS FOR CHINESE MILLS.—Having received the official approval of the Central Political Council concerning its proposals for the employment of surplus funds of the British Boxer Indemnity Refund as security for the purchase of spindles and other textile machinery on long-term credit basis, the Nanking Ministry of Industry is now consulting various Chinese cotton mills in Shanghai regarding such purchases and other related matters. It is learnt that the Ministry of Industry is considering another industrial project aiming at the development of China's famous porcelain industry. Plans are being drafted for the establishment of a porcelain factory at Kiukiang or some convenient center to be financed by appropriations from surplus funds of the British Boxer Indemnity Refund. Machinery of the now defunct China Porcelain Works at Kingtehchen will be utilized by the proposed company. Establishment as soon as possible of a large-scale Government factory for the manufacture of woollen piece goods to meet domestic demands is urged by the Greater Shanghai Chamber of Commerce. The petition points out that woollens have become one of the necessaries of the people, the value of the annual imports having amounted to the figure of over Tls. 50,000,000.

JAPANESE TO PAY.—Foreign business firms in Manchuria, which have been fearing they would lose all money owed to them by the Chinese, have been informed by the Japanese that they will assume full responsibility for most of these debts.

Among items affected by this understanding are 19 light aeroplanes delivered by a British firm to Marshal Chang Hsueh-liang, then Governor of Manchuria, last September, of which 12 were paid for. The Japanese confiscated all these machines.

Some firms have already received payment for goods delivered to the Manchurian authorities before the Japanese started to take charge at the end of September though payment was held up for some time.

Settlement of bills is thought to have been much more prompt under the Japanese régime than if the old Manchurian Government had remained in power, for Marshal Chang's credit is said to have been falling to a low ebb.

MINING

COAL MINING IN CHINA.—In view of the importance to the Lung-Hai Railway of the coal mines in Hancheng, Eastern Shensi, a technical expert of the Chinese Ministry of Industries has been sent there to conduct an investigation on the feasibility of working the mines at an early date. A large coal field has recently been discovered at Lang-Tung-Ko, in Kirin Province. A company has been formed to work the field, the necessary permit having been granted by the Provincial Government authorities. It is estimated that, when fully worked, the new field will produce enough coal to meet the demands of the Kirin and Heilungkiang Provinces for the next 20 years.

ELECTRICAL

ELECTRIFICATION IN JAPAN.—Provided that official permission is obtained the Tokyo Suburban Railway will start work this month on the construction of the first section of its line between the Shibuya and Kichijoji stations on the Government Electric Railway. The Mikko Mountaineering Electric Railway has decided to proceed with the construction of the second section of its line at a cost of Y.500,000. The Watashi-gawa Hydro-Electric Company has decided to erect a 11,230 kw. hydro-electric station on the Niita River in the Kochi Prefecture.

MERGER IN MANCHURIA.—A fusion scheme of power and light companies in Manchuria, some 60 in all, is projected in Manchuria, with a view to further develop the agricultural industry, indicates the telegram received at the Industry Department of Osaka Municipal Office.

The program regarding this plan is as follows:—

1. To electrify the agricultural industry in the entire country within the next five years.
2. To enlarge the power plant in Fushun in an attempt to control the power supplying business in the region of South Manchuria.
3. To build a big transmission plant in Harbin.

The plan calls for some Y.100,000,000 as capital.

HARBIN POWER PLANT.—According to Japanese information, the Harbin power plant and tramway system will be purchased from the new Kirin government by the South Manchuria Electric Co., a Japanese concern.

RAILWAYS

CENTRAL CHINA RAILWAY.—The Hangchow-Lanchi railway, approximately 160 miles, is expected to be completed before the end of March. From Chuki to Lanchi there will be ten stations. It is estimated that the entire line will cost the Chekiang Provincial Government $4,000,000.

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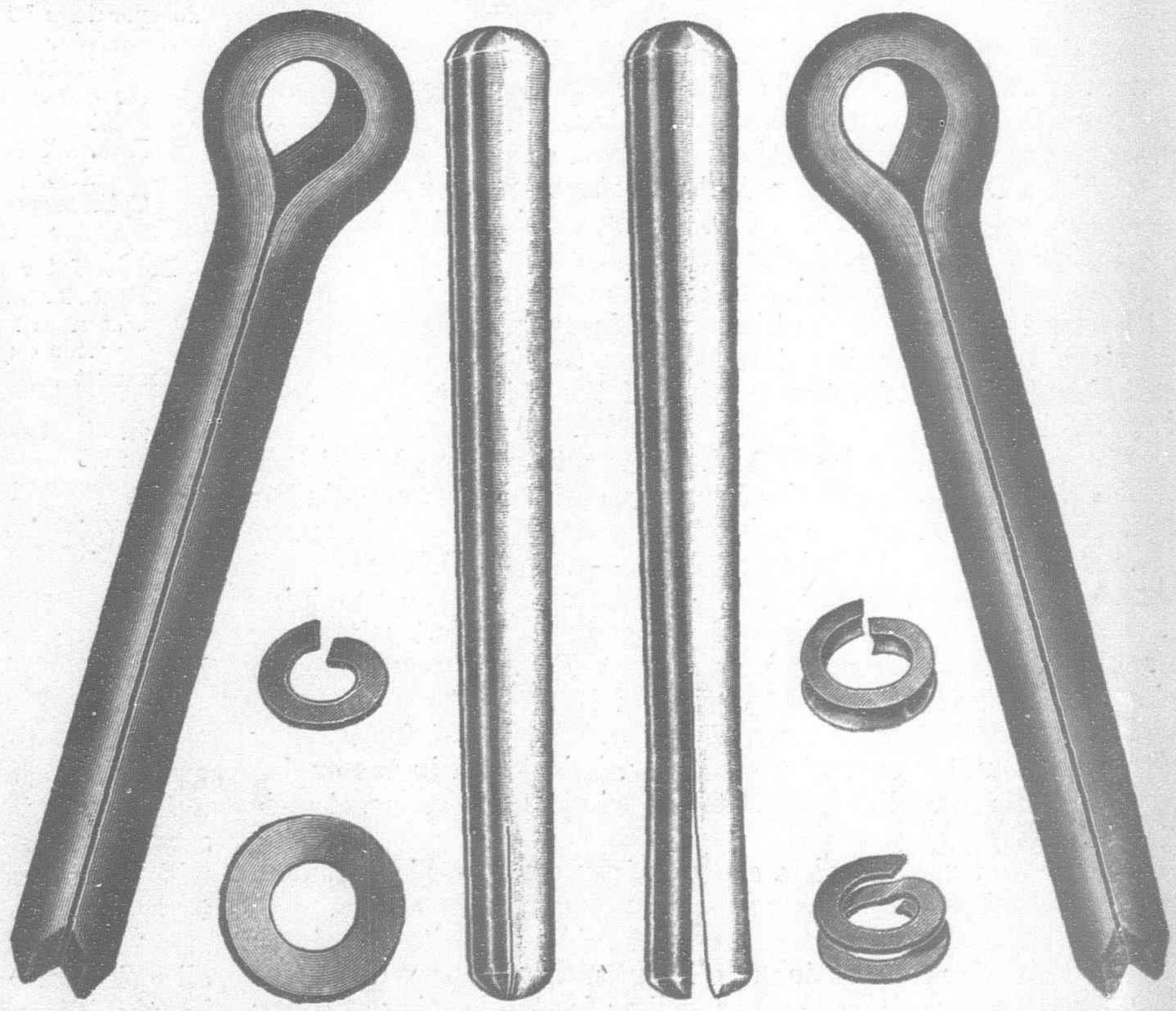

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